

MARINE REVIEW.

VOL. X.

CLEVELAND, O., NOVEMBER 1, 1894.

No. 18.

Plans for New Lights and Fog Signals.

As efforts of lake vessel owners in the session of congress which begins in December next will be directed mainly to securing additional aids to navigation on the lakes, the subject of new lights, fog signals, etc., has received special attention among the executive officers of the Lake Carriers' Association. The visit to Washington of a committee that has had this matter in charge has resulted in the vessel owners expecting earnest support from the light-house board, as reports made by members of the committee since their return have been very encouraging. Commander Wilde, naval secretary of the board, was pleased to find that the vessel owners' petition contained only ten items, a sufficient number of which had reference to fog signals and other small appropriations, so that the sum total did not exceed the amount appropriated for lake lights last season. He gave the committee every encouragement to think that the vessel owners could get the items through congress and promised all the assistance in his power. With the aid of charts the committee went over each item on the petition with him, explaining its necessity, and he seemed satisfied with the explanation. It was found from the reports of district officers that the reports of these officers classified the lights which the committee asked for as among the most important in their districts. Most of the new lights were classed as indispensable in the district officers' reports; one or two were classed as "necessary," and two, viz., Gravelly island, Poverty passage, and Lansing shoal, north of Squaw island, had not been reported upon by the district officers at all. Commander Wilde suggested gas buoys for these points, and the committee agreed that these would answer the purpose admirably.

After going over the items of the petition, the committee took up one or two other matters with Commander Wilde. His attention was directed to the changes in recent years in the character of the vessels, and the date when season insurance on hulls expires, and he was asked to correspond with the district officers to see whether something better than heretofore could not be done in leaving stakes and buoys until the close of navigation. Commander Wilde heartily agreed with all that was said on this subject. He said that the stakes and buoys were there to aid vessels, and ought to be to remain as long as the vessels continued to run, even if a few of them were lost. He promised to take this matter up with the district officers.

Lake Freight Matters.

Ore shippers of Cleveland now realize that notwithstanding all the work of the ship yards, which has brought about an increase in the capacity of the lake fleet that has seemed far beyond requirements, they would have been forced to pay some stiff figures on ore from the head of Lake Superior this fall if the grain movement had not been so limited. The sudden and enormous increase in the manufacture of pig iron has demanded a movement of ore during the past two months that is very much in excess of what was expected, and on some of this ore a higher lake freight would certainly have been paid if competition from grain had been a factor in the situation. As it is, all tonnage offered for ore from the head of Lake Superior is still readily taken at 90 cents, and at one time during the past week there were indications of 95 cents being paid. The prospects of grain shipments, however, are no more encouraging than they have been, and although it is expected that the desire of ore shippers to bring down all the ore that it is possible to move on about the present rates of freight will result in a continuance of the present conditions during November, no special improvement in freights is looked for on the final trips. It is generally agreed that a continuance of the present rate of consumption in ore will result in docks being very well cleaned up next spring, with prospects of shipments next season aggregating 2,000,000 tons more than the movement of the present season.

A Business that Does not go to Buffalo.

The action of the Big Four Railway in increasing its facilities for handling flour at Benton Harbor, Mich., indicates the power of the great Vanderbilt railway system in this country. Although it is not generally known, the greater part, if not all, of the flour that is shipped from points in Minnesota, Wisconsin and Michigan to Chicago and Benton Harbor and which is consigned to the Big Four Railway is transferred from that line to the Chesapeake & Ohio Railway, running from Cincinnati to Newport News, Va., and from the Virginia port it is exported in the steamers of the Chesapeake & Ohio Steamship Company, a corporation organized in England and for which a fleet of a half dozen or more big ships have been built within the past two years on the Clyde. Of course the boats, running be-

tween Newport News and Liverpool, are as much a part of this branch of the Vanderbilt system as are the Big Four and C. & O. roads. The C. & O. traverses the coal, coke and iron regions of the Virginias and finds profitable return freights from those districts. Thus a business for which vessels trading to Buffalo, as well as the Vanderbilt trunk lines running into New York, would be competing, is diverted to the southern port, through the Vanderbilt interests in the Chesapeake & Ohio.

An Important Soft Coal Line.

For some time past the management of the Wheeling & Lake Erie Railway, which runs between Wheeling and Toledo, has been seeking an outlet to Cleveland, and now it is announced that the company is about to secure control of the Valley Railway, a short line running from Valley Junction, O., to Cleveland. The Valley has never been a profitable road of itself. Of late it has been controlled by the Baltimore & Ohio, but it is in the hands of a receiver. This short line would be a very valuable property for the Wheeling & Lake Erie and there is little doubt now of the latter company obtaining it and making it a part of the main line, probably to the extent of removing the shops and headquarters of the W. & L. E. to Cleveland. The W. & L. E. ships a very large amount of coal by lake through Huron and Toledo and finds a remunerative business in carrying ore to the Wheeling furnace district from the lakes. The Cleveland outlet would greatly shorten the rail haul, as the full line of the Valley would be used to Valley Junction, where the W. & L. E. intersects the Valley.

Strong Points in Our New Navy.

In the November issue of the Review of Reviews there is printed an interesting synopsis of an article by Irving M. Scott, the ship builder on the naval needs of the Pacific. Mr. Scott brings out in his article some of the strong points of our new navy. He says:

"To convoy the battle ships and inform them what friends or foes are to be expected, armored cruisers of the Brooklyn type represent the combined opinion of naval architects, and are able to meet all possible requirements,—their size being one of the factors most liable to change, according to the opinion of the bureaus constructing them.

"As to swift destroyers of commerce, America is in the lead with the Columbia or Minneapolis type, which have a theoretical radius of action of 24,000 miles at moderate speed, with the heretofore unattained speed of twenty-three knots, which at present is in advance of any demands.

"For unarmored cruisers, there is the Olympia type, with a large battery of 5-inch rapid firing guns, a speed of twenty-two knots, and high free board, combining large radius of action, great speed, a formidable battery, and a length of hull and draught of water to enable her to enter the small and shallow harbors prevalent on the Pacific.

"For harbor defense purposes, the Monterey, a double-turreted monitor, seems to fill the requirements; while for the shallow rivers, sounds and bays, gunboats of light draught, medium speed, and fair battery, are required to enable the successful patrolling of the shallow waters of our coasts.

"The shallow, crooked and narrow rivers of China require a special cruiser to maintain the position that the United States has always held in that country. The navy department has recognized the importance of this, and two boats, designed especially to meet that want, are now under course of construction.

"While there are other special services that will have to be met by special designs, the above is a general outline of what the emergencies of today require. While it is very desirable, from the point of discipline, to have the various classes described of uniform design, continual improvements and changes in the devices used require modifications in every ship in adopting the latest and best attainable, and this prevents entire uniformity."

Marshal sales are quite numerous of late. Here is the list of the past few days: At Cleveland—Tug Hattie L, to City National Bank, bid in, \$1,150; Schooner Lone Star, to Marine Bank, \$125. At Tonawanda—Small excursion steamer Nellie, valued in insurance register at \$10,000, sold for \$2,000. At Grand Haven—Tug McCormick, formerly owned by Boswell & Pike of St. Joseph, to Thomas W. Kirby of Grand Haven, \$175. The schooner Geo. L. Wrenn, which was started on a trip around the world last summer, was also sold by the United States marshal at Manistee, Mich., but the price is not given.

Steam Tonnage of the Lakes and Other Sections.

James A. Dumont, supervising inspector-general of steam vessels of the United States, has just made an annual report to the secretary of the treasury, and again, in the statistical part of the report, the excess of steam tonnage on the lakes over all other parts of the country is clearly pointed out. The tonnage of steam vessels on the lakes is 90,962.79 tons greater than that of steam vessels on the Atlantic coast. Net registered tonnage is referred to in all cases. Of the steam tonnage of the entire country 41.2 per cent. is owned on the lakes, and this is nearly double the amount owned on the Pacific and gulf coasts and western rivers. As all steam vessels are inspected once a year, the following table giving the number and tonnage of vessels inspected in the several districts shows practically the number and tonnage of such vessels owned in these districts:

STEAM VESSELS INSPECTED, THEIR AGGREGATE TONNAGE, AND THE NUMBER OF OFFICERS LICENSED FOR THE SEVERAL DIVISIONS OF NAVIGATION DURING THE FISCAL YEAR ENDED JUNE 30, 1894.

Divisions.	Steamers.	Net tonnage.	Officers Licensed.
Northern lakes	2,112	658,101.39	9,588
Atlantic coast.....	3,471	567,138.60	16,146
Western rivers.....	980	150,848.06	6,474
Pacific coast.....	618	147,547.34	3,429
Gulf coast.....	581	72,149.88	3,043
Total	7,762	1,595,785.27	38,680

The table shows that the number of vessels owned on the Atlantic coast as well as the number of officers licensed in that section is greater than on the lakes, although the tonnage, as noted above, is 90,962.79 tons less. This is due to the fact that the number of large steam vessels on the lakes—vessels of 2,000 tons and over—is, as shown by reports of the commissioner of navigation, greater than the combined number of such vessels in all other parts of the country. The difference in tonnage of steam vessels on the lakes given here and that given by the commissioner of navigation is due to the report of the commissioner referring to gross tons, while that of the inspection service refers to net tons.

Church's Hay Lake Lights.

We have received the following from P. M. Church & Co., Sault Ste. Marie, Mich., regarding Hay lake channel lights:

"In order to facilitate the passage of vessels through the new Hay lake channel for the balance of the season, we have at our own expense, hung range lights on all the targets that have been erected by the United States engineers to show the courses in the new channels. The lights are all white and can be seen at varying distances from one to four miles, depending on the condition of the atmosphere. They will be found in the following order by vessels bound up the river: Range lights on St. Joseph's island, showing the course through the rock cut in Middle Neebish; range lights at the head of Neebish island, marking the course to Nine Mile point; from thence up, range lights just above Nine Mile point, just above Six Mile point, and a pair nearly opposite each other a little below the cut through the islands. These lights are furnished and maintained at our own expense, and the only remuneration hoped for is increased patronage at our ship chandlery and hardware store, Sault Ste. Marie, from the shipping interests."

Vessel masters who have passed through the channel after dark since the lights referred to have been in operation, say that it is now entirely practicable to run the channel by night, and they are very earnest in commending the enterprise shown by P. M. Church & Co. With the government system of lights in operation next year, these temporary lights will of course be discontinued, but they will serve to prepare all vessel masters for running the river at all times when the more efficient lights are established.

Salaries of Steamboat Inspectors.

A bill that is of interest to inspectors of steam vessels who do most work in the service will undoubtedly be passed at the session of congress beginning in December next. The measure will equalize the salaries of officers of the service, grading them according to the work performed in the various districts. It was passed by the senate during the last session and has been reported favorably by the committee having it in charge in the house, and is now on the calendar of the house. In his latest annual report, Gen. Dumont uses some very plain language regarding this bill. "It is an equitable bill," he says, "to which no just objections can be made, and none have been made, except in the interest of a few officers in the service, whose salaries would be slightly reduced if the bill should become a law, and who seem unduly willing to perpetuate a law giving them two and a half times the salary of other officers rendering four times the amount of service that they themselves render, an injustice it seems impossible congress will longer permit."

Ample Power for Speed Required.

Following is an extract from the annual report of Commodore Geo. W. Melville, engineer-in-chief, U. S. Navy:

In all its designs for machinery, whether for a tug, a battleship or a cruiser, the bureau has, in spite of much adverse criticism, insisted on a fair proportion of weight for power, especially in the boilers; as a consequence, the department has been spared the annoyance of failures on trial trips; and, without exception, all machinery built from its designs has done all, and more than all, that was required of it on the first trial, and without distress, accident or injury of any kind. Such a record is unique, and, when the high powers and unprecedented speeds of some of the vessels are considered, it is one to be justly proud of. In the opinion of the bureau, much of this success is due to its uniform practice of allowing ample power for the speed required with a given displacement, as determined from the carefully observed performances of similar vessels, and having every design, before final adoption, carefully scrutinized, by an engineer officer who has performed service at sea in charge of machinery, this being the only way in which much of the information absolutely essential to the successful designing engineer can be obtained.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Oct. 27, 1894:

	Wheat, bu.	Corn, bu.
Chicago.....	25,225,000	1,210,000
Duluth.....	4,171,000
Milwaukee.....	745,000
Detroit.....	1,498,000	7,000
Toledo.....	3,165,000	8,000
Buffalo.....	2,959,000	188,000
Total.....	37,773,000	1,413,000

At the points named there is a net decrease for the week of 382,000 bushels of wheat, and a net decrease of 398,000 bushels of corn.

Plenty of Water.

Editor MARINE REVIEW: Since Gen. Poe made his request that vessels should pass between the two dredges now working at the foot of Lake Huron, instead of between the red dredge and the light-ship, I have had many inquiries asking whether the water between the two dredges was as good as the water near the light-ship in the course heretofore taken. In reply to a request for information, Gen. Poe writes me that the water between the two dredges is better than that between the red dredge and the light-ship, and that every foot of a channel 1,600 feet wide between the dredges has been dredged over to a depth of 21 feet, so that no vessels now on the lakes should meet with any difficulty in this portion of the channel. Will you kindly publish this assurance from Gen. Poe for the benefit of vessel masters?

C. H. KEEP,

Secretary Lake Carriers' Association,

BUFFALO, N. Y., Oct. 29, 1894.

A Wooden Lumber Carrier.

The Detroit Dry Dock Company has closed a contract with parties represented by C. R. Jones of Cleveland for a single-deck wooden steam-barge, the dimensions of which will be 185 feet keel, 35 feet beam, and 15 feet deep. Engines will be 42 and 22 inches with 36 inches stroke. A Scotch boiler 12 feet 3 inches diameter by 11 feet long and allowed 125 pounds pressure, will be fitted with the Howden hot draft apparatus. The steamer is to be completed next spring.

Cargo and Speed Records.—Lake Freight Steamers.

Iron ore.—S. S. Curry, Hawgood & Avery Transit Company of Cleveland, 4,569 gross or 5,117 net tons, Escanaba to South Chicago; Maritana, Minnesota Steamship Company of Cleveland, 4,260 gross or 4,771 net tons, Escanaba to South Chicago; Selwyn Eddy, Eddy Bros. of Bay City, Mich., 3,897 gross or 4,364 net tons, Escanaba to Ashtabula; Kearsarge, Interlake Company of Cleveland, 3,718 gross or 4,164 net tons, Escanaba to Cleveland.

Grain.—Selwyn Eddy, Eddy Transportation Company of Bay City 130,820 bushels of wheat, Detroit to Buffalo; Centurion, Hopkins Steamship Company of St. Clair, Mich., 147,812 bushels of corn, Chicago to Erie; Onoko, Minch estate of Cleveland, 187,657 bushels oats, Chicago to Buffalo.

Coal.—S. S. Curry, Hawgood and Avery Transit Company of Cleveland, 4,535 net tons bituminous, Conneaut to Gladstone; Selwyn Eddy Eddy Bros. of Bay City, Mich., 4,252 net tons anthracite, Buffalo to Milwaukee.

Speed.—Owego, Union Line of Buffalo, Buffalo to Chicago, 889 miles, 45 hours and 16 minutes, 16.4 miles an hour; Centurion, Hopkins Steamship Company of St. Clair, Mich., Buffalo to Duluth, 997 miles, 67 hours and 50 minutes, 14.7 miles an hour.

Steamship Great Britain.

Editor Marine Review: I notice in your issue of the 4th inst., a letter relating to the above ship, and wherein the correspondent, Francis B. Stevens, speaks of her being under water for nearly two years. I feel sure you will allow me to correct this little mistake. She went ashore in September, 1846, and came off, or rather was floated in August 1847, so that the period was eleven months only. She was then sold, and the new engines, made by Penn, were put into her. She commenced her voyages on the Australian station in 1853, and was finally sold as a coal hulk, and is I believe at the Falkland islands at the present time. This vessel was originally built as a paddle wheel steamer, and it was only after the success of the experiments which attended the trials of the steamship Archimedes that the alteration was made in her design and she was furnished with the original screw engines, with the link chain gearing. The new engines had tooth gearing. It may also be interesting to your readers to know the following facts about her: Keel laid, July, 1839; floated out of dock by Prince Albert, July, 1843; ready for sea and made her first move with her engines, December, 1844; trial trip January, 1845; started on her first voyage to America, July 26, 1845; started on her second voyage Sept. 27, 1845, on which voyage she lost her propeller blades, both outwards and homewards, and after a change had been made in the design of the blades from six to four, she made several passages, frequently running as much as 300 knots per day, and on one occasion 330, until she was sunk in 1846, as stated above.

WEST INDIA HOUSE, Leadenhall St.,
London, E. C., England.

WALTER PHILLIPS,

Society of Naval Architects and Marine Engineers.

Secretary W. L. Capps of the Society of Naval Architects and Marine Engineers announces that the second general meeting of the society will take place in New York City, 10:30 a. m., Thursday, Nov. 15. Through the courtesy of the president and managers of the American Society of Mechanical Engineers, the meetings will be held in the auditorium of No. 12 West 31st street, the sessions extending through Thursday and Friday, Nov. 15 and 16.

There will be a banquet at the Hotel Brunswick, at 7 p. m., Friday, Nov. 16, to which members and their guests are cordially invited. It is earnestly desired that the meetings may be fully attended, in order that the papers presented may be discussed with a thoroughness commensurate with their importance. A list of the papers and writers is herewith submitted:

1. "Some Suggestions of Professional Experience in Connection with the Naval Construction of the last Ten Years, 1884-1894," by Richard W. Meade, rear admiral, U. S. Navy.
2. "The Use of Small Models for the Determination of Curves of Stability," by Mon. E. Bertin, director of the French government school of naval design.
3. "Some Obstacles to Shipbuilding and Owning in this Country," by Geo. W. Dickie, Esq., naval architect, San Francisco, Cal.
4. "Present Status of Face-Hardened Armor," by W. T. Sampson, captain and chief of ordnance, U. S. Navy.
5. "Cellulose and its Application to Warships," by Mon. E. Cheneau, Philadelphia, Pa.
6. "Experience Gained with our New Steel Ships as Regards Care and Preservation," by Philip Hichborn, chief constructor, U. S. Navy.
7. "The U. S. Trippl-screw Cruisers, Columbia, and Minneapolis," George W. Melville, engineer-in-chief, U. S. Navy.
8. "Electricity on Shipboard—Its Present Position and Future Development," by S. Dana Greene, Esq., New York, N. Y.
9. "Hydraulic Power for Warships," by Albert W. Stahl, naval constructor, U. S. Navy.
10. "Yachts in England and America," by Lewis Nixon, Esq., naval architect, Philadelphia, Pa.
11. "A Dynamic Steam Engine Indicator Tester," by Professor Cecil H. Peabody and Assistant Professor E. F. Miller, Massachusetts Institute of Technology.
12. "Steamer and Tow-barge Efficiency and Classification of Lake Vessels," by Jos. R. Oldham, naval architect, Cleveland, Ohio.
13. "Notes on Launching," by William J. Baxter, naval constructor, U. S. Navy.
14. "Accessibility and Circulation of Water Tube Boilers," by L. D. Davis, Esq., M. E., Erie Pa.
15. "Recent Light-draught Gunboats of the U. S. Navy," by J. J. Woodward, naval constructor, U. S. Navy.

At a meeting of the board of directors of the Detroit Dry Dock Company, Monday, Gilbert N. McMillan, who has filled the position of secretary with great satisfaction to the company, was made treasurer. The organization in accordance with this change is as follows: Hugh McMillan, president; A. McVittie, vice-president and manager; Frank E. Kirby, engineer; G. N. McMillan, secretary and treasurer.

Boiler Question in the United States Navy.

As Walter M. McFarland, passed assistant engineer, U. S. Navy, had up to a short time ago been in very close touch with all matters pertaining to the work of the bureau of steam engineering—through his position as secretary to Engineer-in-Chief Melville—considerable interest is attached to some parts of his engineering lectures, delivered recently before the Naval War College, at Newport, R. I. As might be expected, these lectures contain a great deal of matter that has been given out at different times by the bureau of steam engineering, and which is not new to engineers who have kept posted on the work of the bureau, but Mr. McFarland's comments in connection with such matter is of interest. For instance, in referring to the tubulous boiler question in the second lecture he says:

"It seems at the present time as though we were on the eve of a revolution in boilers as great as the change from simple to compound engines twenty-five years ago. The demand for reduced weight and pressure has compelled the resort to crowding the type of boiler which has been in use for the last fifteen years so hard that it seems as though the limit had almost been reached, and that further progress must come about by the adoption of an entirely different form of steam generating apparatus. However, there are good reasons to believe that the present type of boiler will not be entirely displaced for some time to come, and we shall certainly continue to use it for some years."

Such advantages as great reduction of weight, immunity against disastrous explosion, ability to stand severe usage, etc., are all credited in a very liberal way to the tubulous boiler, but Mr. McFarland, alike to the engineer-in-chief, lays great stress on the question of the life of tubes. "Corrosion is a very serious thing with these boilers," he says, "and it is probable the main reason why they have not long ago been adopted for a portion at least, of the boiler power of all vessels. Our experience with the tubes of ordinary boilers has shown that with tubes of ordinary thickness, about such as are ordinarily fitted in coil boilers, the corrosion becomes very serious in about three years, after which time it is practically necessary to retube the boiler. Now in an ordinary cylindrical boiler if a tube leaks while under steam a temporary repair can be made by plugging the tube without hauling the fires or laying up the boiler, and it can be continued in use, but inasmuch as the coil boilers have the steam inside the tubes it is impossible to plug them without hauling the fires, blowing off steam, and letting the boilers cool sufficiently to get into them, or at least insert tools into them for doing the plugging. This, of course, would be a very serious matter if the boilers were of large size and only a few of them in use, as it might in some cases amount to throwing out half the power, or, in some cases, stopping the machinery altogether. The difficulty of feeding these boilers comes from the fact that the amount of contained water is so small that the cessation of the feed pump for even a very short time would allow the amount of water to be reduced below what would be consistent with the protection of the metal from overheating. However, with duplicate feed pumps, and with reasonable care and some experience on the part of the attendants there should be no trouble on this score. With regard to the question of corrosion, however, it should be said that there are instances on record of coil boilers which have been in use for ten years and even longer without giving any trouble from this cause, but they were used in fresh water, and with fresh water entirely. There was never any doubt about their efficient working as steam generators, the only question being whether under the conditions obtaining on large vessels their longevity would be such as to warrant their introduction generally."

Mr. McFarland also explains the several systems of forced draft and quotes Commodore Melville's letter to the secretary of the navy on the subject of 100-foot smoke stacks in the Brooklyn, in which the engineer-in-chief pointed out some of the disadvantages of forced draft. "One of the serious drawbacks attendant upon the use of forced draft," says Mr. McFarland, "is the occurrence of leaky tubes. These leaks always occur where the tubes are fastened in the tube sheet of the combustion chamber. The explanations which have been offered for this phenomenon are very numerous, and some are undoubtedly true while others are merely fanciful. The English navy has been particularly unfortunate in this respect, while our ships, as a rule, have fared very well, and while we have had leaky tubes now and then we have never been compelled to abandon a trial on that account, nor in any case has a very large number of leaky tubes been found. A comparison of the boilers in our service and in the English navy suggests that one reason for their trouble and our freedom from it may be that their boilers are much smaller for the same work. It will be found on investigating the subject that in some of the English ships where there was most trouble with the boilers, there was an allowance of not over 1½ square feet of heating surface to a horse power, while in our service we almost invariably allow more than two square feet, and only in one case, so far as I am aware, has the proportion fallen below two feet, and then only a trifle.

"It will appear obvious, on consideration, that the tube sheet and tube ends must be clean, and that there must be a fair circulation of water

around them, and this has been demonstrated conclusively to be the case by careful experiments. It had also been maintained by some able engineers that one cause of the trouble was having the tube sheets too thick. It was, perhaps, natural that in a plate whose section was so very much reduced as is that of a tube sheet that there should be a desire to make this up by increasing the thickness. Experiments were made by Dr. Kirk, Mr. Yarrow, and others which showed conclusively that when the thickness of a tube sheet exceeded certain very reasonable dimensions, say $\frac{3}{8}$ inch, there was a considerable difference in the temperature on the two sides of the tube sheet, when the thickness assumed unusual dimensions the difference in temperature of the two sides was very great.

"To overcome the defect of leaky tubes without putting in new boilers the English navy has resorted to what is known as the admiralty ferrule, which is simply a thimble with the outer end flanged over so as to protect the end of the boiler tube from the direct impact of the flame. These have thus far given pretty general satisfaction except that what is called 'bird's nesting' seems to be more prevalent when the ferrules are fitted than when they are not. This phenomenon consists in the formation of a growth of tenacious soot or fine ashes growing out from the sides of the tubes until it finally closes over them entirely. We have

Torpedo Boat Chasers for U. S. Navy.

In his annual report Commodore Melville of the bureau of steam engineering, navy department, makes a short note saying that two preliminary designs have been made for the machinery for torpedo boat destroyers; one of these is for machinery of 6,000 horse power and the other for 4,500 horse power. The fact that the department had considered the construction of boats of this type was not generally known. From the wholesale manner in which Great Britain has gone to building the destroyers, it would seem that other nations will be forced to give this type of boat attention. A naval architect just returned from England says it is a common but interesting sight over there to observe a dozen or more of these speedy vessels chasing each other.

Log Towing Question.

Log towing companies of Michigan are making a determined effort to induce the Canadian government to suspend action regarding the duty on boom sticks until the question, as it relates to lumber interests in the United States, may be presented to Congress at the next session. Secretary of State Gresham informs the lumbermen that he has had a conference

NAME.	WEIGHTS.										T'L TRIP PERF'M'NCE.				MODERATE SPEED.							
	Steam Pressure.	Air Pressure.	Revolutions.	Displacement. <i>a.</i> normal; <i>b.</i> deep load draft.	Engine Room.	Fire Room.	Total machinery.	Coal. <i>a.</i> normal. <i>b.</i> bunker capacity.	Machinery and Coal. <i>a.</i> normal. <i>b.</i> deep load.	Per cent. displacement in machinery and coal. <i>a.</i> normal; <i>b.</i> deep load.	Speed.	I.H.P.	Coal per I.H.P.	Coal per day for all purposes.	Radius of action.	Speed.	I.H.P.	Coal per I.H.P.	Coal per day for all purposes.	Radius of action.	Weight of engine per I.H.P. full power.	Weight of boilers per I.H.P. full power.
					tons	tons	tons	tons	tons	per cent	knts		lbs.	tons	knts	knts		lbs.	tons	knts	lbs.	lbs.
Pensacola	30	nat dft	32	3000	185	163	348	312	660	22.0	9.0	1161	3.55	44.5	1520	7.00	550	3.50	21.0	2500	356.9	314.5
Wampanoag	32	nat dft	31	4370	612	638	1250	750	2000	46.0	16.8	4049	3.15	138	2190	11.4	1275	^d 2.75	38.0	5400	338.6	352.9
Charleston	<i>a</i> 91	1 1/4	114	3730	337	395	732	328	1060	28.4	18.2	6666	3.0	216	665						113.2	132.7
	<i>b</i>			4481				760	1492	33.3						10.5	1200	3.25	45.0	4275		
San Francisco ...	<i>a</i> 135	2	125	4088	433	481	914	350	1264	31.0	19.52	9717	2.4	250	655						99.8	110.9
	<i>b</i>			4666				628	1542	33.2						10.5	1250	2.40	35.0	4462		
Olympia	<i>a</i> 166	2	139	5570	507	732	1239	400	1639	29.5	21.7	17313	2.3	428	485						65.6	94.7
	<i>b</i>			6588				1093	2332	35.4						12.0	1850	2.40	52.5	6000		
Minneapolis	<i>a</i> 165	1	133	7350	694	1226	1920	750	2670	36.2	23.0	21000	2.3	520	795						74.0	130.8
	<i>b</i>			9054				1700	3620	40.0						13.0	2725	2.30	72.0	7370		
Vesuvius	<i>a</i> 155	2	270	771	79.5	170	249.5	25	274.5	35.6	21.4	3795	2.3	95	135						46.9	100.3
	<i>b</i>			965				152	401.5	41.6						13.0	975	2.35	25.0	1900		
Cushing	<i>a</i> 250	3	370	105	24.5	30.0	54.5	10	64.5	61.4	22.5	1760	2.0	37.5	143						31.2	38.2
	<i>b</i>			137				30	84.5	61.7						13.0	150	2.00	3.3	2840		

d—superheated steam used.
e—coil boilers.

d—superheated steam used.
e—coil boilers.

PROGRESS OF IMPROVEMENTS IN MACHINERY OF UNITED STATES NAVAL VESSELS.

Table showing progress of improvements in machinery of vessels of the United States Navy from the time of the old sloop-of-war Pensacola of 9 knots speed to the fast triple-screw cruiser Minneapolis of 23 knots. Prepared by W. M. McFarland, passed assistant engineer, United States Navy.

never had any trouble with this phenomenon in this country, but in England it has several times caused the loss of a trial trip."

These extracts from Mr. McFarland's lectures, as well as the table showing progress in marine machinery, which is printed herewith, are taken from the Engineer of New York, in which the lectures are being published in full.

Sale of the Chapin.

As had been expected, the sale of the Chapin mine under mortgage foreclosure proceedings at Iron Mountain, Mich., on Monday has resulted in full control the property, with all of its machinery and other valuable equipment, as well as the hydraulic power plant, falling into the hands of M. A. Hanna & Co. of Cleveland. The price given is approximately \$89,000, but of course this is a nominal figure, as the purchasers were the principal creditors and the sale of the mine was in reality a settlement among creditors on the best terms that could be made. With the present owners the Chapin will undoubtedly be worked in the future to the full extent of conditions warranted by the ore market, and although the ore is not of Bessemer grade it is near enough to the limit to insure sales when any ore is selling. The sale means also that the fleet of steel steamers controlled by M. A. Hanna & Co. will again be engaged almost entirely in carrying Chapin ore from Escanaba.

with the British ambassador at Washington, and the latter promised to telegraph to the attorney general of Canada, asking a suspension of the sale of the boomsticks of the Saginaw Bay Towing Association, seized in Georgian bay for non-payment of the tax of 27 per cent. imposed by the customs department. These sticks are to be offered for public sale Nov. 6. Secretary Gresham says also that he has requested a conference between American and Canadian log owners and the Canadian authorities at an early date. The Michigan lumbermen have appointed a committee to go to Ottawa for the purpose of asking the privy council for a suspension of the duty.

Only one new boat, the steel freight steamer Globe, built by the Globe Iron Works Company, Cleveland, is classed in the November supplement to the Inland Lloyd's Register. The Globe is valued at \$185,000, and rated At. J. H. Ball, who is connected with the Globe Company, is acting temporarily as managing owner. The tonnage of the boat as fixed by the customs department is 2,995.84 gross and 2,278.96 net and her official number is 86,307. The barges Mineral State and Peshtigo are withdrawn from the insurance register.

Another of the British torpedo boat destroyers, the Rocket, built by J. & G. Thomson, Clydebank, has shown on trial a mean speed of 28 1/4 knots, equal to 32.53 statute miles.

Niagara River Dam and Drainage Canal.

Opponents of the Chicago drainage canal have evidently enlisted the support of Major E. H. Ruffner, United States engineer at Buffalo, as that officer has had published a letter, in which he presents arguments against the plan of damming Niagara river. Major Ruffner bases his arguments on the recent action of the navigation committee of the Cleveland chamber of commerce in urging a consideration of the Niagara dam project, which the committee says "would give increased depth to our harbors and rivers, and as the attempt would be simply to maintain high water level, it is not evident what damage would ensue."

"If the action of this committee be followed up by the support of the Cleveland chamber of commerce," says Major Ruffner, "and the idea be seriously considered, then the matter becomes one of much more than local importance to that city. It becomes one of general interest to navigation, and of very great importance to Buffalo, in particular. Some time ago when the question was in some degree discussed, Gen. Poe wrote a long letter to one of the Cleveland marine papers (the MARINE REVIEW, issue of Sept. 7, 1893), calling attention to many points that had not been fully discussed by the advocates of damming the head of the Niagara. He showed quite clearly that the true expenses of the scheme had not been considered by those who limited themselves to thinking only of the actual cost of the dam itself. In point of fact, that would be the smallest item in the account. To those who now navigate the head of the river, and pass down by the inlet pier of the waterworks, and bring their empty tows up the rapids, the additional current to be caused by damming up the head of the passage so as to increase the head by one foot at mean lake level would be a matter of importance. It would be probably destructive of profitable commerce down the river. I have not calculated the exact increase of the current, but the practical experience gained while dredging on the Horse Shoe reef above the rapids shows how great an increase of current comes with high winds down the lake, and it does not take much calculation to convince one that when the proposed dam increases the head one foot, and the wind and other conditions are the same, there must be much more current on the rapids than now experienced at any time. It is true that this difficulty can be overcome by making a ship-canal from the lake to Black Rock; and it is also true that for many reasons such a canal would be a great improvement, and may be a possibility in the dim future, but there would be a large cost, and the construction would be a matter of some time. In point of fact, the time and money would be much more than the same items for the dam; the secondary becomes the primary, in respect to these features.

"The advocates of the plan of damming the river say that the dam need not cost more than \$600,000. Granted; what would the ship-canal cost? Or would the Tonawanda and Niagara Falls people (who are just beginning to hope that their port is to enjoy lake commerce to some extent) be willing to give up their shipping that Buffalo creek may have one foot more of water without dredging?

"But there is another consideration that concerns Buffalo itself, more directly than the preceding. We are now passing through the low water period of the cycle of precipitation. During a term of years the amount of rainfall, and the consequent stage of water in the lakes, passes from a minimum to a maximum and back again. For some years we have good water, then it becomes high water, and finally drops to low water, and then goes through the circle again. For the past three years we are at the bottom of the ladder; a heavy snow fall, more spring rains, and the scale may turn. Then if we have made arrangements for raising our level on this lake we may have occasion to regret it. Our storms raise the level here as much as five feet, and if at that particular time the outflow down the Niagara river is to be throttled, who is to say that the material damage to Buffalo, and its shipping, docks, and interests, will not be as much or more than the gain from the dam? All of our docks, warehouses, and the break-water itself are built to accommodate existing conditions. None of these are fit for an increase in the mean lake level of one foot. Changes must be made in all, at more or less expense, and as experience may show to be required. All of your low lands, your Buffalo creek overflows, your southern regions, are directly interested in an increase in the lake level. Do you expect the United States to make this damage good, or do you pay for it yourselves? In either case the cost is to be added to that of the dam. The extra foot you may wish in your harbor can be dredged at a cost that is easily calculated, and easily provided for; all of the consequences of the proposed dam are more or less problematical, and you must wait till the occasion comes before you can foot the bill. Which is the simpler and least expensive? With these considerations to be decided, it certainly would not do to let the proposition now before the Cleveland chamber of commerce go unchallenged.

"There is a question nearer our doors, however, than this one. The Chicago drainage canal has been planned by its promoters without any consultation or any consideration of the interest of other communities. It does not fall to our lot, then, to ask if what they propose to do could not be done cheaper and better in some other way. We might ask why the plan adopted in Berlin was not followed out in Chicago. We might ask why the modern idea of separating sewage water from storm waters is not

followed out, and the sewage rendered innocuous, or even profitable, as has been done and could be done. We might ask what course would have been thought of, had Chicago's size been placed on Cleveland's site—as all inland cities must consider. In point of fact, the whole system of the disposal of sewage is to be studied and re-applied in all of our great cities before many years. But however that may be, we can postpone these questions in favor of one that does concern Buffalo, and all navigational interests. We can let Peoria discuss how she may avoid the sewage when it reaches her, and we may let St. Louis think herself safe at her distance but we must consider our own share of the burden.

"The advocates of the canal propose to draw from the lakes about 10,000 cubic feet of water per second. It is true no one but their engineers know how this has been calculated; nor how wide and how deep the canal will be when opened—in fact, not on paper; but we can take the figures given us and see what bearing they have on this lake. Some have stated that the level of Lake Michigan is higher than that of Lake Huron; some putting that difference as high as $5\frac{1}{2}$ feet; some content themselves with only $19\frac{1}{2}$ inches. The lake survey carefully examined this question and pronounce that there is no permanent difference in level between these lakes, or at most not over one-tenth of a foot. So when the canal is opened the water shall be drawn directly from the lake level, and consequently from the only exit it now has, the chain of lakes and rivers. How much is 10,000 cubic feet per second? The low water flow of the upper Ohio is only 1,600 cubic feet per second; of the Seine only 1,700; of the Great Kanawha 1,100; of the Wisconsin some 3,000. Of the larger outflows, that of the Mississippi at St. Paul is 5,800 f. s.; of the Connecticut at Hartford 10,000; of the Willamette at Portland, Ore., 13,200 f. s.; and of the Mississippi at Hannibal about 20,000 f. s. These may illustrate what a drain is proposed, a river in fact—a navigable river of ample dimensions.

"Now discharge measurements made here in December, 1891, and in May of the next year, show that the discharge of the Niagara river at what we call mean lake level is about 230,000 cubic feet per second. If the drainage canal drew its 10,000 f. s. at this stage, the proportion would be one twenty-third part, or $4\frac{1}{3}$ per cent. It is not known to me exactly at what stage of the lakes the standard drainage flow was calculated for. Our precise figures for the discharges and gauges are:

Gauge + .2, discharge 233,500 f. s.

Gauge — .5, discharge 223,800 f. s.

"That is to say, for a loss of 10,000 cubic feet per second there was a fall of seven-tenths on the gauge. This, of course, means that at this stage (and this year the stage has rarely been exceeded, and has been from 6 inches to a foot lower), vessels can carry that much less cargo after the drainage canal is opened than they did before, the weather conditions being the same. It shall be a comfort, of course, to think that the navigation on the Mississippi may be benefited, and that the loss of the lakes shall be the gain of the river. When the gauge read—1.2 the discharge was 211,000 f. s.; that is to say that there was a further drop of seven-tenths more for a loss of 12,800 f. s. It so happens that for a change of one-third of a foot on the gauge for the lower readings the discharges vary by about 9,000 f. s. Possibly the natural dam of the Niagara causes the eccentricities noted in the observations; at any rate there is a gradual change in rate of discharge as the water rises from the lowest stages to that known as mean lake level from 9,000 f. s. per one-third of a foot to 4,700. This holds good only over the narrow limits through which we took our measurements. If one wished to determine the law for higher gaugings, more measurements would be needed. But it is important to know that for low water on the lakes the effect of the drainage canal at this point is going to be about seven-tenths of a foot in depth of channels. That is to say, vessels must carry that much less cargo after the canal is opened, than they could were it not in existence. What are you going to do about it?"

About Nov. 20, the third-order light at Twin River point, Lake Michigan, will be established, without change of characteristic, at a height of 111 feet above the mean level of the lake, in the tower recently erected immediately in the rear of and to the westward of the keepers' dwelling. During the three or four nights preceding the exhibition of the light from the new structure the light will be extinguished and there will be exhibited, as a substitute, from the watchroom gallery of the old tower, a fixed white lens-lantern light, forced to its greatest brilliancy.

In the second of the Northern Steamship Company's passenger steamers the number of large and elegant staterooms with bath and other special features of convenience will be increased. On the North West these rooms were the first to be engaged every trip, showing that most patrons of the line want the very best accommodations.

In a mock torpedo attack recently on the cruisers Cincinnati and Detroit lying at anchor in the harbor of Newport, the torpedo boats Cushing and Stiletto were both discovered several times by the search lights on the cruisers while well without the 700 yard zone of attack, and the result of the night's work was in favor of the cruisers.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—\$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1894, was 318 and their aggregate gross tonnage 525,778.57; in all other parts of the country the number of this class of vessels was, on the same date, 211 and their gross tonnage 314,016.65. The classification of the entire lake fleet on June 30, 1894, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels.....	1,731	843,239.65
Sailing vessels.....	1,139	302,985.31
Canal boats.....	386	41,961.25
Barges.....	85	39,214.51

Total..... 3,341 1,227,400.72

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
Year ending June 30, 1889.....	225	107,080.30
" " " 1890.....	218	108,515.00
" " " 1891.....	204	111,856.45
" " " 1892.....	169	45,168.98
" " " 1893.....	175	99,271.24

Total..... 991 471,891.97

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1893.	1892.	1891.	1893.	1892.	1891.
No. vessel passages	12,008	12,580	10,191	3,341	3,559	4,207
Ton'ge, net regist'd	9,849,754	10,647,203	8,400,685	7,659,068	7,712,028	8,698,777
Days of Navigation	219	223	225	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

IN the battle of the boilers—tubulous vs. cylindrical—few controversies have attracted as much attention in marine engineering circles as that which has culminated in Mr. James Howden, the Englishman of hot draft reputation, issuing to the makers of water tube boilers and the Belleville boiler in particular, a challenge for a trial in actual service of the merits of the water tube and cylindrical boiler. Although the trial is to occur in England, the outcome will be awaited with considerable interest on the lakes, where modern practice has resulted in a partial adoption of the water tube boiler, and where Mr. Howden's system of draft has been fitted to several large steamers and is to be fitted to more of them. Mr. Howden evidently has the courage of his conviction, as shown by the challenge, which appeared in last week's issue of the REVIEW, and which proposes the determination of no particular point in the two types of boiler, but includes weight, space occupied, evaporative power, economy, heat wasted and all other essential particulars. The information to be obtained will undoubtedly be of great value. The British representatives of the Belleville boiler have not as yet fully accepted the challenge but there is little doubt of the trial taking place.

WHATEVER may be said of faults in laws governing the steamboat inspection service of the United States, and the interpretation and enforcement, or rather lack of enforcement, of such laws by the service, it is certain that in the matter of boiler inspection the groundwork of this department was well laid, and we take pleasure in quoting the following paragraph from the annual report of Gen. Dumont: "The value of the inspection of steam boilers by this service is strikingly illustrated in the fact that of the nearly 11,000 boilers inspected in the United States during the year ended June 30, 1894, accidents causing loss of life have occurred to but fifteen of them, whereas the necessity of such inspection is exemplified by the fact that defects, more or less dangerous, on upward of 700 boilers were detected, remedied, and made safe under the watchful care of the inspectors, although it must necessarily be conceded that under the most watchful supervision of steam boilers, absolute immunity from accidents can not be expected or guaranteed."

MR. FRED MORSE of the Illinois steel Company, who was in Cleveland during the week, is understood to take a rather unfavorable view of the railway outlook from the steel makers' standpoint. The manufacturers of railway material are dealing with the railways on what is practically a

cash basis only, on account of the depressed financial condition of most railways. It is a fact, nevertheless, that the railways of this part of the country have not for a long time past been crowded with business as they are at present. This refers more especially, of course, to lines in the lake trade, but it may be that Mr. Morse is prompted in his opinion largely by the slow revival of business conditions throughout the country west of Chicago, where it is admitted that improvement will not be as rapid as in the central west and the east.

THROUGHOUT the entire dominion of Canada there was not a single steam vessel built in 1893. The number of sail vessels built in the dominion during the year was 362 of 28,440 net tons. Forty-nine sail vessels were built in the province of Ontario during the year, but their aggregate tonnage was only 4,126. On Dec. 31, 1893 the number of vessels of all kinds on the registry books, of the dominion was 7,113 and the tonnage 912,539 net. The loss in tonnage as compared with the same date in 1892 is 51,590 tons, as compared with 1873, twenty years previous, the loss is 161,179 tons, but this variation is not of great significance, as the total of tonnage on the books of the dominion during twenty years past has never exceeded 1,333,000 tons, and the gain or loss from one year to another has been very light. The figures here quoted are from the latest annual report of the department of marine and fisheries.

REPORTS are again current on the other side regarding the big Atlantic passenger steamer for the White Star line, that is to reduce by full twenty-four hours the time of the Atlantic voyage. It is said that Harland & Wolff, the famous Belfast builders, have received orders to begin preparations immediately for the construction of the big ship. There is no doubt of the White Star management making a great effort to produce a boat far in advance of the Cunarders Campania and Lucania when they finally decide to do more building, but it is difficult to imagine what increase in power would be necessary to reduce the Atlantic record by a full day.

GEN. POE is quoted as saying that the government will eventually be forced to buy the property of the Union Dock and Coal Company below the St. Mary's Falls canal. The general is right, and he might have added without any fear of criticism that the property should be bought now, in order to avoid heavier charges for it later on, and also to save the vessel interests the costs incurred in locking tows through the canal under unfavorable conditions of weather, and which will increase as the business of the canal increases.

GEN. POE, Lieut.-Col. Stickney and Capt. Marshall of the army engineer corps have of late been gathering facts on which to begin a formal preliminary survey of a route for the visionary Lake Erie-Ohio river ship canal. A deplorable waste of time is certainly involved in congress forcing eminent engineers to engage on work connected with schemes of this kind, and it will be surprising if these gentlemen do not hint as much in their report when it is finally submitted.

THERE can be no truth in the report that the American Steel Barge Company is preparing to establish at Pittsburg a ship yard for the construction of whalebacks for the river trade. If Capt. McDougall has any such plan in mind, it will be necessary to secure capital for the enterprise from some source other than the present conservative directors of the barge company.

THE past fiscal year is the first probably in the annals of the steamboat inspection service of the United States when there has been no loss by fire, one of the most dreaded accidents that can befall a ship. Attention is directed to this fact in the annual report of the supervising inspector-general of steam vessels covering the year ended June 30, 1894.

CANADA has in eleven years past expended \$193,546.48 on the Georgian bay survey. The work is now nearing completion.

Notices to Mariners.

Commander Gridley says of buoys in the tenth light-house district: "Buoys west of Erie and those at the islands will be taken up between the 12th and 30th of November, and winter buoys substituted. Buoys of Detroit river and the light vessels at Bar point, Limekiln crossing and Ballard reef will remain as late as the season will permit, probably Dec. 5.

A crib has been sunk at the outer end of the west pier, Port Dover, Ontario. The crib extends 100 feet beyond the light-house. The contractors maintain a small light at the end of it.

Reference last week to the 16-foot boilers in the new steamer Globe, built by the Globe Iron Works Company of Cleveland, prompts an inquiry relative to dimensions of boilers in the big Cunard steamers Campania and Lucania. Boilers in these ships are 18 feet diameter and 17 feet long, and some of the plates are 20 feet long by 7 feet wide and 1 $\frac{1}{2}$ inches thick. Eight furnaces are provided for each of these boilers.

Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

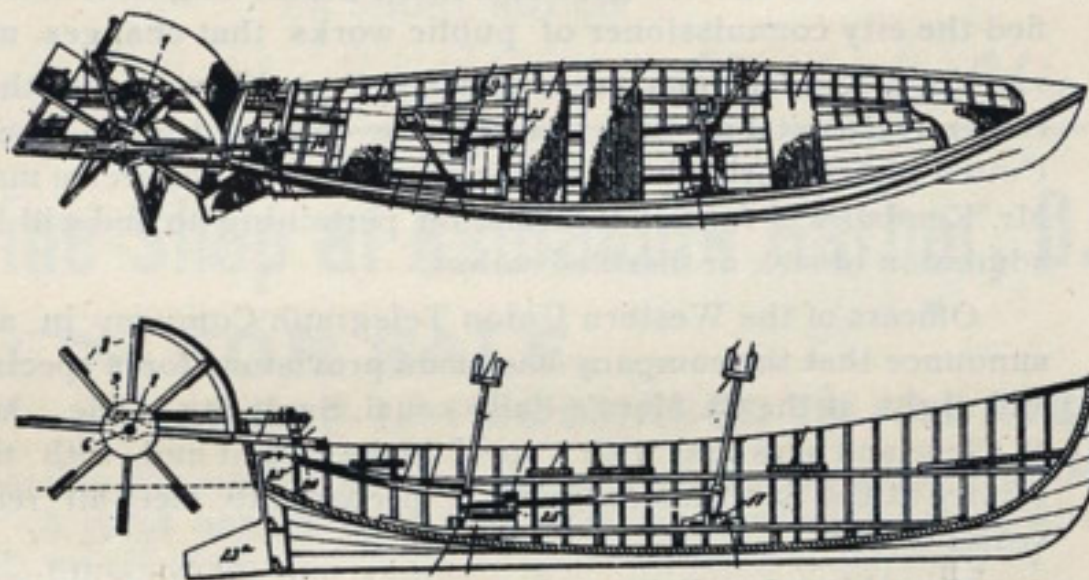
527,762. Dredging Machines. Lindon W. Bates, Chicago, Ill. Filed Sept. 4, 1894. Serial No. 522,014.

Claim. The combination with a dredge boat and its pivoted ladder and suction pipe of a ponton provided with a well-way, the tracks or plates *a* on the side walls of the ponton, and brackets carried by the ladder and provided with rollers to run upon the tracks

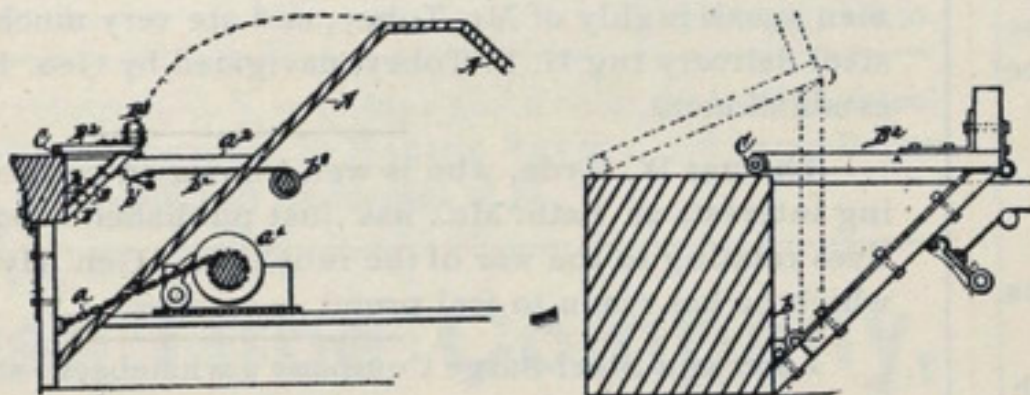
527,798. Marine Propulsion. John S. Martin, Snohomish, Wash. Filed Jan. 2, 1894. Serial No. 495,407.

Claim. The combination with the hull of a boat, the cross-timber, the rearwardly disposed parallel beams having bearings, the paddle shaft arranged in the bearings and having cranks at its ends, the paddle wheel arranged upon the shaft, of the slotted blocks secured to the sides of the beams, the short vertical levers intermediately fulcrumed in the slotted blocks, the pitman rods loosely connected at their rear end to the cranks of the shaft and at their front ends slotted and pivotally and adjustably connected with the upper ends of the short levers, the slotted bearing blocks in front of the seat, the levers pivoted at their lower ends in the bearing blocks, said levers above their points of pivot having slots, and the rods pivoted in the slots of the lever and at their rear ends provided

527,798. MARINE PROPULSION.



527,800. DUMPING SCOW.



with slots in which are pivoted the lower ends of the vertical levers, the cross-heads at the upper ends of the operating levers, and the pairs of handles on the cross-heads.

527,800. Dumping Scow. Peter Clencimino, Brooklyn, and Frederick W. Mattocks, New York, N. Y. Filed Oct. 24, 1893. Serial No. 488,985.

Claim. In a side dumping scow, the combination with the inclined deck, the side rail and swinging door, of a load line gage rail hinged to said side rail and normally arranged at an angle substantially parallel with the deck, the guard board hinged to the upper portion of the gage rail, and fastening or locking devices.

527,991. Feathering and Paddle-Wheel. Joseph Jacobs, Nevada City, Cal. Filed Mar. 20, 1894. Serial No. 504,423.

Claim. A propelling wheel consisting of a body composed of a metallic skeleton filled with wooden pieces leaving openings near the wheel rim, and covered on each side by metallic plates formed with openings in their outer edges, a series of driving blades composed of metallic skeletons filled with wooden pieces and covered on each side with metallic plates, radial shafts carrying said blades and mounted in the wheel rim, cross arms on said shafts playing in and out of the openings in the sides of the wheels, the fixed cam track against the ends of which said arms come in contact and against the body of which said arms travel whereby said blades are turned and held through a portion of the revolution of the wheel, and the fixed cam blocks adjacent to the ends of the cam track and lying in the path of said blades whereby through contact therewith said blades are returned, the whole wheel being adapted to be completely submerged.

Trade Notes.

Crawley & Johnston of Cincinnati report that they have closed a contract for another of their "Cincinnati" steerers, to be fitted to the steamer Valley Queen of New Orleans.

Charles W. Whitney, who represents in this country the manufacturers of Serve's ribbed tubes and Purves' ribbed boiler furnace flues, was in Cleveland, Tuesday. Mr. Whitney is trying to introduce his specialties on the lakes, and says that he feels certain of a large sale for them, if secured in a single boat.

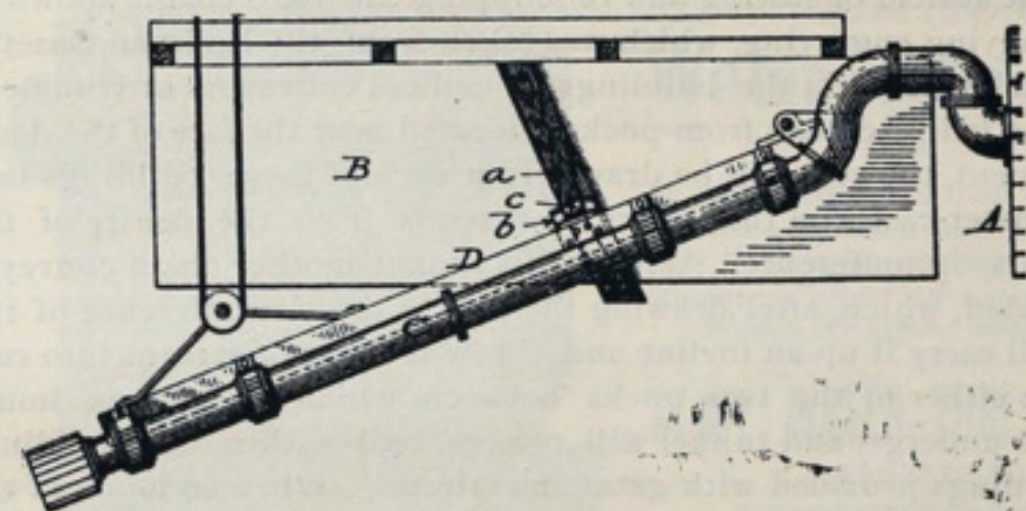
Firms engaged in equipping new vessels will be interested in two contracts announced from Bath, Me. N. T. Palmer of that place will build a 1,400-ton four-masted schooner and the Eastern Steamboat Company proposes to build there a screw passenger steamer costing about \$50,000, to run between Portland and Belfast.

In General.

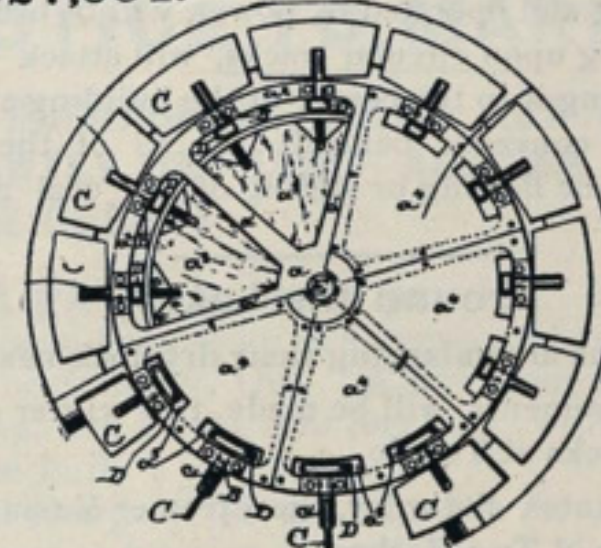
The outside skin or plating of the small torpedo boats carried by the second-class battleship Maine, is only $\frac{3}{8}$ of one inch in thickness.

In his annual report, Engineer-in-Chief Melville makes this statement regarding the big cruisers of the new navy: "In the Minneapolis, the Columbia, the Olympia and the New York we have produced a quartet of cruisers which, in point of speed, is unequaled by a like number of ships of any navy in the world. Their trials were most exhaustive and the

527,762. DREDGING-MACHINE.



527,991. FEATHERING PADDLE-WHEEL.



results such as to leave absolutely no doubt as to the real speed. Subsequent examination of the machinery failed to disclose any weakness or defect of any nature whatever in the machinery."

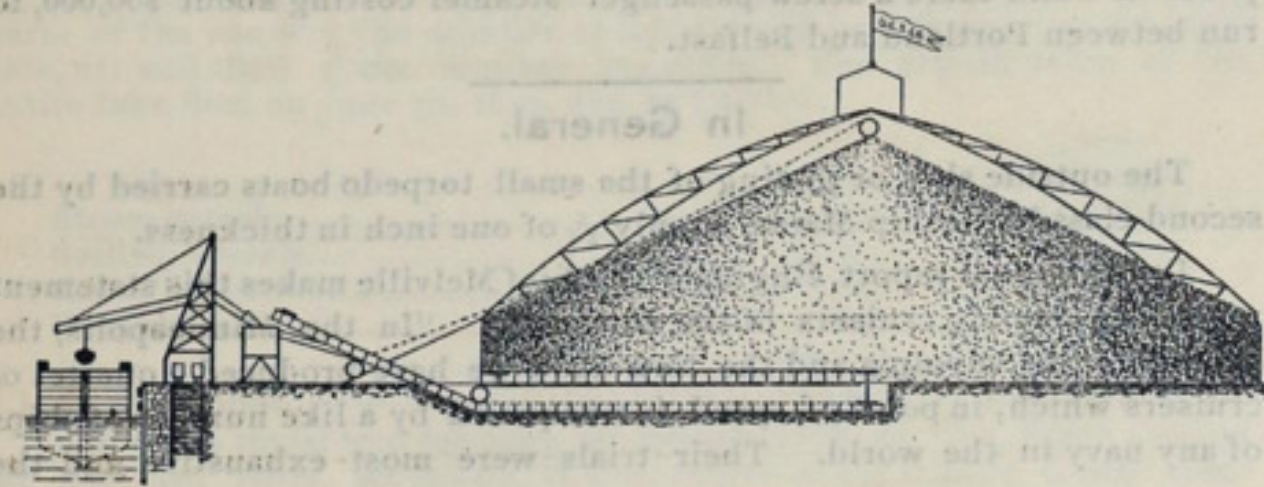
As showing the great weight of contained water in large Scotch boilers, it may be noted that one of the main boilers in the U. S. S. New York weighs without water eighty-two tons, while the contained water weighs forty-two tons. This matter of contained water is one of the arguments against the Scotch boiler and in favor of boilers of the tubulous type.

Speed records for war vessels have been broken several times of late. Of course, the British torpedo boat destroyers lead the small vessels of war, and of these the Daring, built by Thornycroft & Co., is without question accorded first position, on account of her remarkable run of a little over 29 knots or nearly 33½ miles an hour. The Daring is 185 feet long, 19 feet beam and 13 feet deep with a displacement of 228 tons. Among war vessels ranging up into thousands of tons displacement, the new United States cruiser Minneapolis, built by the Cramps of Philadelphia, is according to the best available records, "Queen of the Seas." Her record of 26½ miles, equivalent to a little over 23 knots, is the highest attained by ships of large tonnage. This speed was reached with triple screws and an indicated horse power equipment of about 21,000 for 7,350 tons displacement.

IF YOU SEND \$1. TO THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O., FOR FOUR STEEL ENGRAVINGS OF U. S. WAR SHIPS, ON HEAVY CARD, AND ARE NOT SATISFIED WITH THEM, WE WILL REFUND THE MONEY.

Buildings for Handling and Storage of Hard Coal.

At West Superior, Wis., the Lehigh Valley Coal Company is erecting on a new dock at Tower bay slip a novel plant for handling hard coal. The dock comprises about 500,000 square feet and has some 800 feet frontage. Part of it will be used for the handling and storage of soft coal, but interest attaches especially to two large circular buildings with parabolic roofs erected for the storage and handling of anthracite. The system represented in this form of building and its equipment is known as the Dodge system, and the patents involved in it are controlled by the Dodge Coal Storage Company of Nicetown, Pa. The system is new to the lakes, but records of the plants elsewhere are said to warrant the conclusion that cost of handling by this method at West Superior, inclusive of the work of unloading vessels, will not exceed 5 cents a ton.



Each of these buildings is 246 feet in diameter and about 10 feet high at apex. The system of storing and re-shipping the hard coal is shown in the accompanying engraving, which was taken from the Railroad Gazette. The coal will be stored in the buildings by endless conveyors or trimmers, which will be fed by chutes from pockets located near the face of the dock. For re-shipment, the coal will be drawn from each of these buildings into a 6-foot diameter cast iron tunnel, which extends from the centre of the building to its circumference. Within this tunnel another chain conveyor will be operated, which, after drawing the coal to the circumference of the building, will carry it up an incline and throw it through screens into cars located upon either of the two tracks between which the screen house stands. The underground tunnel will receive coal within the buildings through openings provided with gates and chutes. When so much of the coal has been removed in this manner that it will no longer flow by gravity through the openings into the tunnel, a ground re-loader, pivoted at the center of the building and operated by power, will be brought into service. This conveyor moving upon circular tracks, will attack either side of the remaining coal, drawing it to the center of the building and there discharging it into the tunnel conveyor beneath. In all of these operations the prominent feature is the flowing or sliding of the coal and the avoidance of breakage.

Around the Lakes.

A. Gilmore & Sons are enlarging their dry dock near Ironville.

Extensive improvements will be made this winter on the Columbus & Hocking Valley docks at Toledo.

In forty-five minutes, Saturday, the steamer Yuma was loaded with 3,028 gross tons of ore at Two Harbors.

Capt. Daniel Moore of Gibraltar, Mich., is building in the ship yard at that place a small schooner for the river trade.

Schooners Itasca and Penokee have been stripped at Toledo and will hold their cargoes of hard coal until spring.

Anthracite coal shipments out of Buffalo during October amounted to 389,378 tons, making the total for the season 1,953,355 tons, which is

136,348 tons less than for last season up to the same date. Shipments during October were greater than during any other month this season.

From Craig's ship yard to the Hocking Valley dock at Toledo the channel is now reported to be 20 feet deep and 240 feet wide. The government dredge is still at work on the channel.

Of the eight or ten harbor tugs at Toledo, the T. M. Moore is credited with having secured more than a full share of the business. Capt. Frank Harmon of the Moore is thoroughly acquainted with the channels.

Dunbar & Sullivan, well known lake dredging contractors, have a contract on the Lachine canal, and have sent one dredge that has been engaged on lake work, to Montreal to be used on the new contract.

It is announced from Alpena that the wreck of the steamer D. M. Wilson, sunk two miles northeast of Thunder Bay island light, is an obstruction to navigation. Lights will be hung on the spars of the wreck when weather permits.

Corrigan, McKinney & Co. of Cleveland have leased another iron furnace, the Sharpville of Sharpville, Pa. This firm, which is interested very largely in iron mines of Lake Superior, is branching out quite extensively in the furnace business.

Under the name of the Grand Rapids & Chicago Steamboat Company, Mr. W. R. Owen of Chicago has joined interests with parties at Holland, Mich., and will place the steamer Sault City on the route between Holland and Chicago with the steamer Holland, thus establishing a daily line.

Abutments of the new Van Buren street bridge, Chicago, are said to extend 20 feet farther into the river than is allowed by the permit for the construction of the bridge, and United States Engineer Marshall has notified the city commissioner of public works that changes must be made.

Ed. J. Kendall, marine reporter at Port Huron, says the Marine and General Hospital at that place is now prepared, with a surgeon of the United States marine hospital service in charge, to receive marine patients. Mr. Kendall will furnish information pertaining to and will look after the admission of sick or disabled sailors.

Officers of the Western Union Telegraph Company in all lake cities announce that the company has made provisions for a special service, day and night, at the St. Mary's Falls canal, Sault Ste Marie. Manager Buell of Cleveland says that with a special lake circuit and with this particular service at the Sault his company is prepared to meet all requirements of vessel owners.

The ship chandlery and vessel supply business of H. P. Tobey of Toledo is now seven years old. This is the only concern that has successfully competed with a 40-year old firm in this line at that place. Vessel men speak highly of Mr. Tobey, and are very much accommodated by the steel delivery tug H. P. Tobey, navigated by Geo. Hardy, solicitor for the establishment.

Thomas W. Hyde, who is well known in connection with ship building interests at Bath, Me., has just published a book of personal narratives relating to the war of the rebellion. Gen. Hyde has a war record of which he has reason to feel proud.

American Steel Barge Company's whaleback steamer Everett, building at Everett, Wash., was launched last week. She is 360 feet long, will carry about 4,300 tons and has triple expansion engines built by the Frontier Iron Works of Detroit, Mich.

Official computations place the horse power developed on trial by the battleship Maine at 9,229. This is 229 horse power more than was required by contract and the builders of the engines, the Quintard Iron Works, will receive a bonus of \$29,900, or \$100 for every horse power over 9,000.

"The man who knows so much about his profession that he cannot learn something about it by reading and study, has a very small profession or a very large cranium."

Marine and Mechanical Literature and Periodicals.

	Per Year
Nautical Dictionary, [Patterson].....	\$ 5 00
Nautical Dictionary and Marine Review.....	6 00
Engineering, [London], Weekly.....	10 00
Engineering, [London], Weekly and Marine Review.....	11 00
The Engineer, [New York], Semi Monthly.....	2 50
The Engineer, [New York], and Marine Review.....	4 00
Engineering, [New York], Monthly Magazine...	3 00
Engineering, [New York] and Marine Review..	4 00
American Shipbuilder and Marine Review.	3 00
Emerson Binder, [that will hold 52 Nos. of the Marine Review].....	1 00

MARINE REVIEW,
516 Perry-Payne Bldg., CLEVELAND, O.



GARLOCK PACKINGS.

Our Elastic Ring, Sectional, Spiral and Special Water Packings are the leaders in this line. For Steam, Water, Ammonia, High Speed Work and all places where packings are used they excel. Try our Special Water Packing, fully guaranteed for water end of pumps. See that our trade mark is on each package. Correspondence solicited.

NEW YORK, 136 Liberty St. PITTSBURGH, 99 First Ave.
CHICAGO, 56 & 60 So. Canal St. OMAHA, NEB., 922 Farnam St.
PHILADELPHIA, 28 N. 5th St. ST. LOUIS, 415 Morgan St.

THE GARLOCK PACKING CO.

Factories and Main Offices: PALMYRA, N. Y. ROME, CA.



The Martin-Barriss Co.

IMPORTERS AND MANUFACTURERS OF

Mahogany, White Mahogany,

AND ALL NATIVE CABINET WOODS.

HIGH GRADES OF KILN DRIED WOODS FOR
CABIN WORK AND INSIDE TRIM.

White Oak Timbers and Plank

CONSTANTLY ON HAND AND SAWED TO ORDER
ON SHORT NOTICE.

654 Seneca Street,

Cleveland, Ohio.

Machine Shop at Ashtabula Harbor, O.

FOR SALE...

CHEAP IF PURCHASED IN 15 DAYS.

Best location for marine work, at the greatest ore receiving port on the lakes. A great chance for a first class mechanical engineer who understands repair work.

Full description on application.

H. T. RASER,

Ashtabula, Ohio.

FOUR steel engravings of U. S. war ships and a color plate of the steel steamer Gratwick will be forwarded by MARINE REVIEW, 516 Perry-Payne Bldg., Cleveland, O., to any address on receipt of \$1.

Syracuse Tube Company,

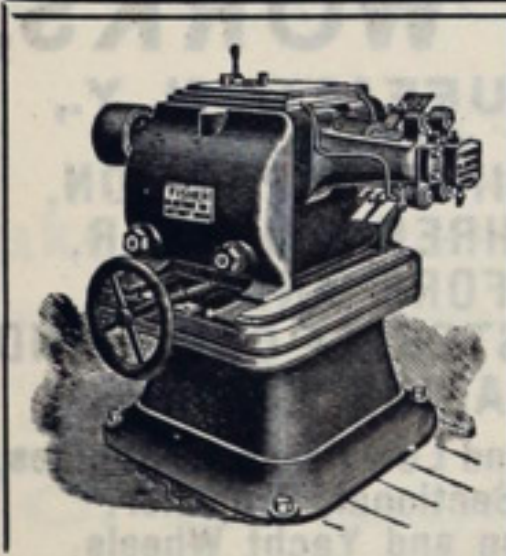
SYRACUSE, N. Y.

MANUFACTURERS OF

BOILER TUBES

OF THE BEST GRADES ONLY.

The Belleville Boilers in the two Great Northern
Steamers are constructed of Syracuse Tubes.



"Ninety per cent. of the Electric Lighting Plants
on the inland lakes have been installed by
the Fisher Co., of Detroit, Mich.

**ALL THE GREAT FLEETS ARE EQUIPPED WITH
OUR PLANTS.**

Fisher Electrical Mfg. Co.

183-185-187

LARNED ST., W.

Detroit, Mich.

GRUMMOND TUG LINE

WRECKING

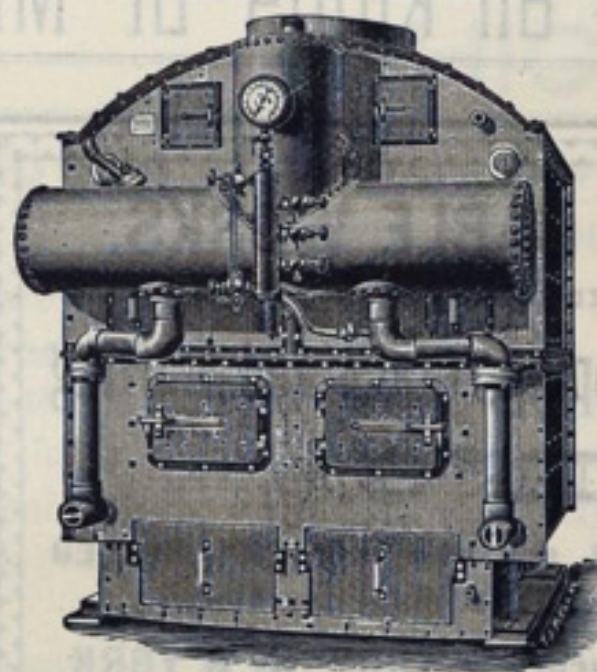
TUG SWAIN STATIONED AT MACKINAW CITY.

TUG CRUSADER STATIONED AT THE "SOO."

TUG CHAMPION STATIONED AT DETROIT.

ALL WITH WRECKING OUTFITS ABOARD.

U. GRANT GRUMMOND, Mgr., - Detroit, Mich.



ALMY'S PATENT

SECTIONAL

Water • Tube • Boilers.

NOW USED IN

18 Passenger Boats from 70 to 160 feet long.

27 Steam Yachts from 50 to 160 feet long.

U. S. Torpedo Boat "Stiletto."

Numerous Small Launches and Stationary

Boilers are giving most excellent results.

ALMY WATER-TUBE BOILER CO.,

47 CLIFFORD ST.,

PROVIDENCE, R. I.

NOTICE TO MARINERS.

FUEL AND DOCKAGE AT POINT AUX PIN—SHIP STORES
CONSTANTLY ON HAND—ALGOMA PARK HOTEL AND
SUMMER RESORT.

ALGOMA PARK, At Point aux Pin, Just Above the Soo,
Ontario, has been opened up as a summer resort by Messrs. Kirkwood
& McKinnon of Sudbury, Ont. A new stone hotel, store, parks, etc.,
are the features, and a dock 200 feet long, with a depth of 20 feet of
water, has been built.

The small charge of \$1 will be made for tying up at the dock,
for each 24 hours or fraction thereof, for all classes of freight carriers.

They will keep a supply of fuel and ship stores of every descrip-
tion constantly on hand, and will have the dock lighted at night and
a bell sounded in thick weather. Masters finding themselves in this
locality during thick or unfavorable weather of any kind, are invited
to take advantage of the accommodations offered. At out-port of
customs and postoffice have been established.

KIRKWOOD & MCKINNON,

ALGOMA PARK,

Just above the Soo.

POINT AUX PIN,

ONTARIO.



C. E. GROVER, President. WM. KENNEDY, Vice-President. W. A. COLLIER, Sec'y & Treas.

The Vessel Owners Towing Company,

W. A. COLLIER, Manager.

Wm. Kennedy,
Alva B.
Cris Grover,
H. L. Chamberlin,
C. G. Curtiss,

Tom Maytham,
Joe Harris,
W. D. Cushing,
Dreadnaught,
Allie May.

DOCK OFFICE, MAIN ST. BRIDGE.

Telephone 409.

CLEVELAND, OHIO.

Steam Pumps, Hawsers, Divers, Etc., Furnished on Short Notice.

F. W. WHEELER,
President.

E. T. CARRINGTON,
Vice-President.

F. L. GILBERT,
Secretary.

F. W. WHEELER & CO., WEST BAY CITY, MICH.

Builders of all kinds of METAL AND WOODEN SHIPS.

AMERICAN CHAIN CABLE WORKS.

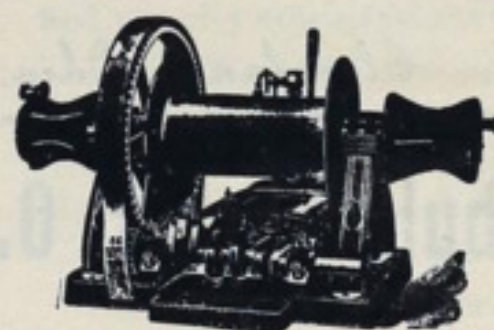
ESTABLISHED 1865.

Cable, Dredge, Quarry, Shipping, Crane and Rafting

CHAINS.

Our DREDGE and CRANE CHAINS are made of IRON ROLLED SPECIALLY for that purpose. Send for Price List.

J. B. CARR & CO., Manufacturers, TROY, NEW YORK.



JACKSON & CHURCH,

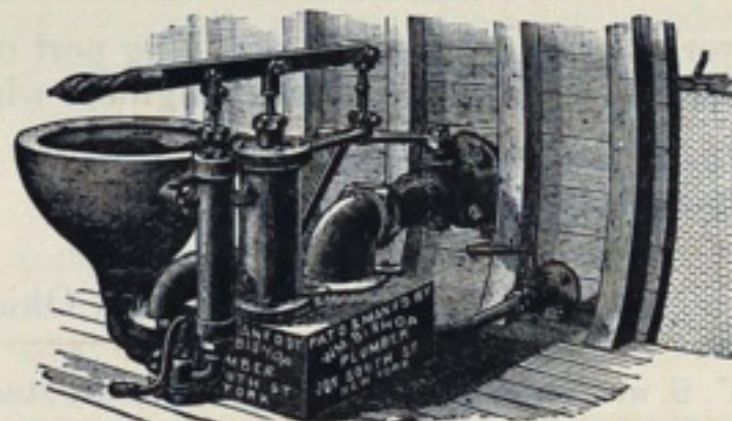
Builders of DUPLEX HOISTING and DECK ENGINES.

Plain Finished and Automatic ENGINES, From Heavy Patterns at Moderate Prices.

Vertical, Horizontal, BOILERS Strictly First-Class Marine & Locomotive and Highest Test.

Send for Circulars and Prices. SAGINAW, MICH.

Patent Pump Water Closet.



For Yachts, Pilot Boats, Naval Ships, Etc.

For above or below water line. In use on U.S. Cruisers New York, Columbia, and Battleships Indiana, Maine, Texas, Massachusetts, Etc. Our No. 4 can be put in a space 15 in. x 15 in.

WILLIAM BISHOP & SON,

205 South St., NEW YORK,
724 Third Ave., BROOKLYN.

Telephone 569 Franklin.

Yacht Fittings a Specialty.



SHIP LAMPS.

OIL AND ELECTRIC FIXTURES

FOR Steamships, Yachts, &c.

GREAT VARIETY OF DESIGNS.

Prices and Cuts on Application.

PAGE BROS. & CO.,

(FORMERLY WILLIAMS, PAGE & CO.)

227 to 233 Cambridge St.,

BOSTON, MASS.

H. G. TROUT, KING IRON WORKS,

BUFFALO, N. Y.,

MANUFACTURERS OF

TRIPLE EXPANSION,

THREE CYLINDER,

FORE AND AFT

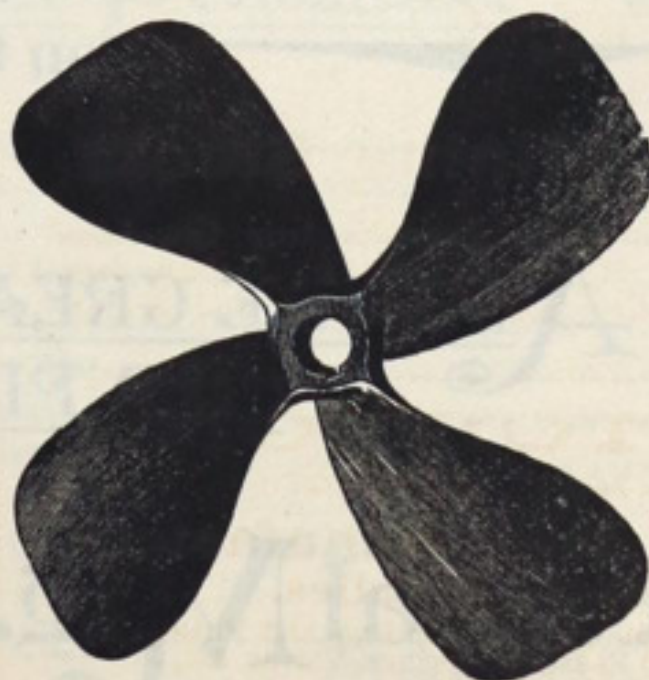
And STEEPLE COMPOUND MARINE ENGINES,

High and Low Pressure Engines, Sectional, Propeller.

Tug and Yacht Wheels.

Cowles Aluminum and Manganese Bronze Propeller Wheels.

These Wheels are noted for their extra speed, towing power and proportionate saving of coal.



PRICES QUOTED ON APPLICATION.

THOS. DREIN & SON, TATNALL AND RAILROAD STS. WILMINGTON, DEL.



Builders of Metallic Life Boats and Rafts, Yachts and Pleasure Boats. Life Preservers. Outfit for Lake Steamers a Specialty.

THE "CINCINNATI"

AUTOMATIC

STEAM STEERING GEAR

A Simple, Powerful Machine. Noiseless and Sure.

SEND FOR CIRCULAR.

CRAWLEY & JOHNSTON,
119-121-125 E. Pearl St., CINCINNATI, O.

For BOLTS, NUTS, WASHERS, RIVETS Etc., Etc.

ADDRESS:

Sternbergh & Son,
READING, PA.

GEO. B. CARPENTER, Pres't. BENJ. CARPENTER, Treas. JAMES CHANNON, Mgr

SOUTH CHICAGO

SHIP CHANDLERY COMPANY,

— DEALERS IN —

Cordage, Cotton Duck, Oakum, Paints and Oils,
TACKLE BLOCKS and MARINE HARDWARE.

170 92d Street, SOUTH CHICAGO, ILL.

DIXON'S Graphite Pipe Joint Grease

Enables you to MAKE A TIGHTER JOINT than you can possibly make with red lead. You can do it easier, and parts can be separated at any time without breaking anything. Send for sample and circular.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

DIXON'S Lubricating Graphite

Is fully explained in an INTERESTING AND INSTRUCTIVE PAMPHLET which is FREE to all interested. It will pay all Engineers and Machinists to SEND FOR IT.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

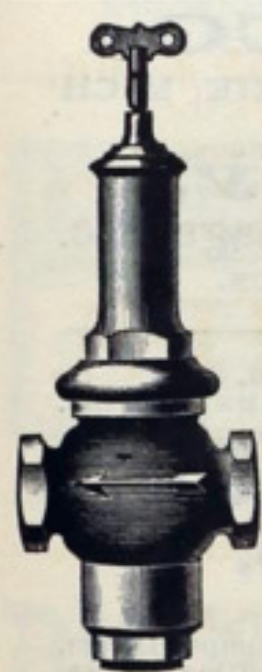


ROOM 7
FOOT OF NORTH MARKET ST.
18TH STREET BRIDGE.
ILLINOIS CENTRAL SLIP "C."
METROPOLITAN BLDG.
CHICAGO.

For Sale, Cheap**STEAMER HENRIETTA,**

Suitable for short passenger or ferry route. Dimensions: 130 feet long, 28 feet beam, and 6 feet hold. Engines: Two horizontal, 14 by 48 inches, steam being furnished by two 12 feet by 42-inch boilers, with 32 3-inch flues. Stern wheel. Draft, light 3½ feet; loaded 5 feet. Capacity 150 tons coal. Two smoke stacks. Address,

A. W. PRIEST, - Kaukauna, Wis.

**THE MASON
REDUCING VALVE**

Was adopted by the U. S. Naval Engineering board. It is the standard in the Danish and other foreign navies; also on the Pennsylvania and 120 other railroads. It is made to wear.

MASON REGULATOR CO.
BOSTON, MASS.

1880.

1893.

CHAS. H. POTTER & CO.,
Investment Bankers,
Cleveland, O.

Dealers in

Lake Superior Iron Mining Stocks,

on about 10 per cent. annual dividend basis, Republic Iron Co., Lake Superior Iron Co., Champion Iron Co., Minnesota Iron Co., Jackson Iron Co., Cleveland-Cliffs Iron Co., Chandler Iron Co., Chicago and Minnesota Ore Co.

C. H. McCUTCHEON,

(Successor to SAMUEL McCUTCHEON.)

Copper, Tin and Sheet Iron Manufactory,
Steamboat and Engineers' Supplies.

All kinds of Brass Cocks, Globe Valves and Couplings, &c. Iron Pipe and Fittings, and Mill Supplies. Rubber Belting, Hose and Packings, Springs, Valves, &c., Leather Belting and Usudurian Packing.

Telephone No. 68.

No. 18 Ohio Street, BUFFALO, N. Y.

NOTICE IS HEREBY GIVEN,

That MR. RICHARD E. RISPIN,

Late General Agent of the **SUN INSURANCE COMPANY**, of San Francisco, ceased his connection with the company in that capacity on the 20th day of March, 1894, and is no longer in the employment or in any way connected with said company or its business. All monies or credits due that company being payable only to signature the undersigned.

H. STEPHENSON SMITH,

Chicago, Oct. 1st, 1894.

MARINE SECRETARY.

SHERIFFS STEAM STEERER.

MADE IN TWO SIZES.

Are easy to adjust and can be handled by any one.

The Steerer can be arranged to set in pilot house or aft.

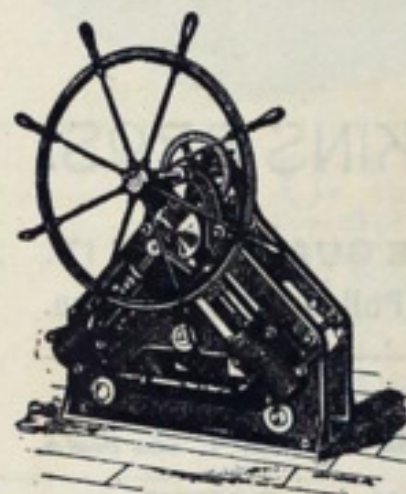
No Steerer will be sold without a quadrant.

Steerer will be sold on approval.

Manufactured by

SHERIFFS MFG. CO.,

126-130 Barclay Street,
MILWAUKEE, WIS.

**Barge Brooklyn For Sale!**

This barge is lying at Toledo and is in fair condition. She will carry 650 tons of coal. Her fit-out is in good condition. Can be bought for \$800 if sold at once.

GEO. E. HARDY, 140 Water St., TOLEDO, O.

MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

259—FOR SALE—Tug 100 feet long, 20 feet beam and 56 tons net, built of Delaware oak; diagonal knees and galvanized fastenings. Equipped with powerful compound engines. Boat now in service in Philadelphia.

260—FOR SALE—Machine shop at Ashtabula Harbor, O. Write H. T. Raser, Ashtabula, O., at once.

261—WANTED—A small steam yacht. Give particulars and lowest price.

262—FOR SALE—Cheap; A lot of new and second hand steam launch, yacht and propeller engines—single, compound and triple expansion. Stationary engines. Over 200 steam pumps of all kinds and sizes. Also several marine and stationary boilers.

263—WANTED—Steam yacht, about 50 feet, with cabin; must be in good condition and cheap. Send photograph.

STERLING, WELCH & CO.

12 and 14 Euclid Ave., CLEVELAND, O.

BOAT FURNISHING A SPECIALTY.
CARPETS, OIL CLOTHS,
CURTAINS, &c., &c.
SUPPLIED AT WHOLESALE RATES.

Swain Wrecking Co.
E.M. PECK, Pres.

The TUG FAVORITE
STATIONED AT CHEBOWGAN, MICH.
WITH COMPLETE WRECKING OUTFIT
IN CHARGE OF
CAPT. MARTIN SWAIN

THE CANADIAN WRECKER SAGINAW
STATIONED AT DETROIT, MICH.
ENABLES US TO WRECK IN CANADIAN
WATERS

STEAM PUMPS AND SUB-MARINE
WORK IN CHARGE OF
JOHN S. QUINN
ADDRESS ALL COMMUNICATIONS TO
PARKER & MILLEN
OFFICE IS AT WATER ST. WEST
DETROIT, MICH.



1894. OCTOBER. 1894

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31					

3-12 INCH ROTARY.
1-14 INCH WORTHINGTON.

DIVING RIGS
AND
DIVERS
ABOARD
AT
ALL TIMES

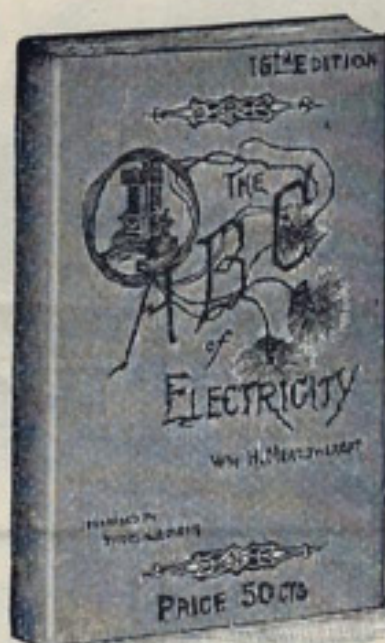
0-100 TON JACKS
1-12 INCH HAWSER

TELEGRAPH
PARKER & MILLEN.
DETROIT, MICH.

ABC ELECTRICITY

By WILLIAM H. MEADOWCROFT

Endorsed by THOS. A. EDISON.



WHAT THE PRESS SAYS.

"A clear and comprehensive little treatise."—*N. Y. Sun.*

"Electric Science is making magnificent strides and this book fills a useful office in setting forth the features and characters of these advances."—*Brooklyn Times.*

"The need of such a book has undoubtedly been felt by many... we predict for it a splendid sale."—*The Age of Steel.*

"A book like this should be largely read."—*N. Y. Herald.*

"The book is well illustrated, and no pains have been spared to make it accurate and reliable throughout."—*Electrical Review.*

"In simple language, the author lays bare the secrets of electrical science and application."—*Electrical World.*

"A vast amount of useful importance."—*Washington Post.*

FROM THE LABORATORY OF THOS. A. EDISON,

ORANGE, N. J., Sept. 24, 1888.

DEAR SIR—I have read the MS. of your "A B C of Electricity," and find that the statements you have made therein are correct. Your treatment of the subject, and arrangement of the matter, have impressed me favorably.

Yours truly,

THOS. A. EDISON.

PRICE, 50 CENTS.

MARINE REVIEW, 516 Perry-Payne Bldg.,
CLEVELAND, OHIO.

P. M. CHURCH & CO.,
SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH
LEADING DEALERS IN
Ship Chandlery,
Marine Hardware, Paints, Oils, Packings, Cordage, Etc.
FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.

H. A. HAWGOOD, President. GEO. ELSEY, Jr., Gen. Mgr. J. A. SMITH, Sec'y.
PHILIP MINCH, Vice-President. J. R. SPRANKLE, Treas.

The Cleveland Tug Co.

FIRST-CLASS TUGS,



Steam Pumps, Divers, Hawser, Lifting Screws, etc., furnished promptly on orders by telegraph or otherwise.

Steamers when outside wanting our Tugs, blow one long whistle and as many short ones as they want Tugs.

Office, Open Day or Night, East End Main St. Bridge,
Long Distance Telephone 919. CLEVELAND, OHIO.



WHEN YOU SEE THIS.....
ON A VALVE,.....

The.....
Simplest, Strongest, Surest,

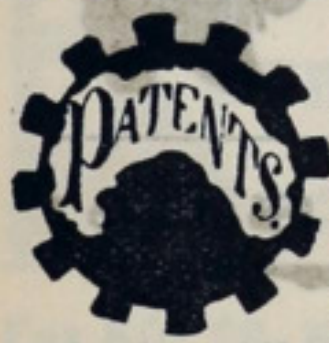


ITS THE JENKINS BROS.

FOR THE WORST PLACE YOU HAVE, AND WE GUARANTEE IT.
JENKINS BROS., New York, Boston, Philadelphia, Chicago.

EDWARD C. WEAVER, LL. M.,

900 F. (op. Pat. Office.)
Washington, D. C.
Attorney and Counselor
in Patents, Trade
Marks, Revenue
Claims and all claims
against the U.S. Make
a clear statement of
your invention or
claim, and I will
advise you free of
charge. Send stamp
for my pamphlet.



PATENTS.

FRANK L. DYER,

918 F. Street,
Washington, D. C.

References: American Steel Barge Co.;
Capt. Alexander McDougall.

AN EXTRA COPY OF THE PHOTO-GRVURE SUPPLEMENT OF DIRECTORS OF THE LAKE CARRIERS' ASSOCIATION, TOGETHER WITH THE LARGE ENGRAVING OF THE STEAMER NORTH WEST, BOTH OF WHICH WERE CONTAINED IN OUR BIG ISSUE, WILL BE MAILED IN A PASTEBOARD TUBE TO ANY ADDRESS UPON RECEIPT OF 50 CENTS IN STAMPS.

IF YOU ARE INTERESTED IN THE NEW UNITED STATES NAVY, YOU WILL WANT PICTURES OF THE NEW YORK, (SEE SUPPLEMENT IN A LATE ISSUE.) PHILADELPHIA, BALTIMORE AND VESUVIUS, STEEL ENGRAVED ON HEAVY CARD BOARD 10x14 INCHES. SEND \$1 FOR THE FOUR TO THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O., AND WE WILL ADD A COLOR ETCHING OF THE STEEL STEAMER GRATWICK, FREE.

FRANKLIN HOUSE

Cor. Bates & Larned sts. only a block from Woodward & Jefferson Aves., DETROIT, MICH.
THOROUGHLY RENOVATED. Very central. Per day, \$1.50. H. H. JAMES.

A copy of the 50-cent North West edition will be mailed to any one sending a \$2 subscription within 30 days to the
MARINE REVIEW,
516 Perry-Payne Bldg., Cleveland O.

PATENTS

Promptly secured. Trade-Marks, Copyrights and Labels registered. Twenty-five years experience. We report whether patent can be secured or not, free of charge. Our fee not due until patent is allowed. 32 page Book Free.
H. B. WILLSON & CO., Attorneys at Law,
Opp. U. S. Pat. Office. WASHINGTON, D. C.

RELIEF LINE AND HALF TONE

The NATIONAL UNION
Photo-Engraving Co

ESTABLISHED 1891

PERFECT PLATES FOR EMBOSSEING

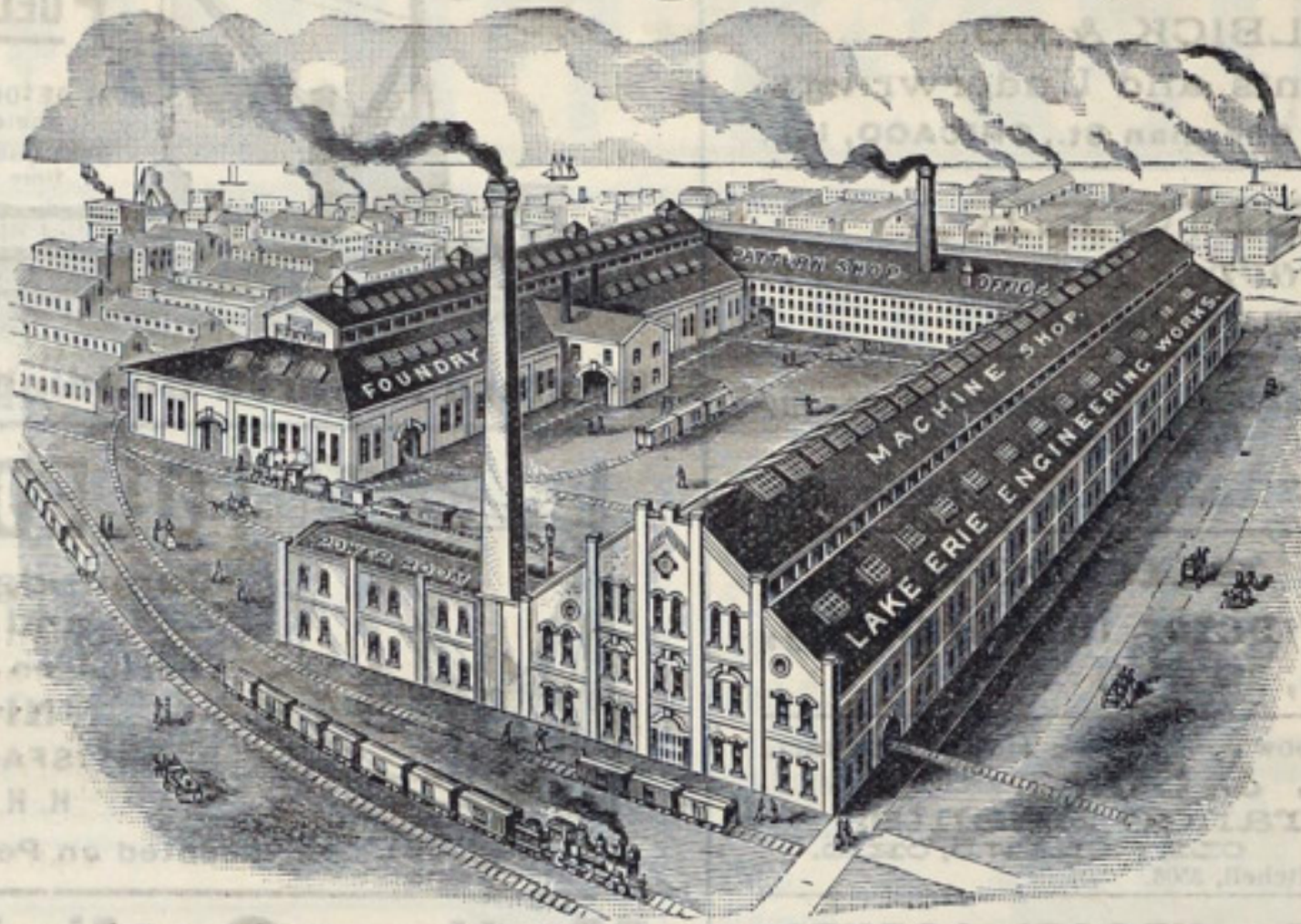
COR. ST. CLAIR & ONTARIO STS.
CLEVELAND, O.
TELEPHONE 501

Lake Erie Engineering Works, Buffalo, N. Y.

RICHARD HAMMOND, Pres't.

JOHN COON, Sec'y and Treas.

Steam Engines,
Compound, Triple
and Quadruple
Expansion
Engines,
From 250 to 10,000
Horse Power
For Marine and
Stationary
Service.



Special Designs
for Cable
Railways and
Electric Power
Plants.

The Best Economy
and Regulation
Guaranteed.

THE BEST EQUIPPED PLANT IN AMERICA.

The Chase Machine Co.

111 ELM ST., CLEVELAND, O.,

...MACHINISTS AND ENGINEERS...

MANUFACTURERS OF

LAND AND MARINE ENGINES and STEAM PUMPS,

SOLE OWNERS AND MANUFACTURERS OF

Chase Fog Whistle Machine.

Over 150 in use on the best class of Lake Steamers.

Special Attention given to Marine Repair Work.

ENGINEERS' SUPPLIES.

ASBESTOS PIPE AND BOILER COVERING.

TELEPHONE 994.

DO YOU?

attach importance to the economy that reaches down
to touch the smaller items of your Expense Account?

True, it may perhaps involve only a few dollars
in any one year, but in the selection of your STEAM
your purchases strictly to the best made, viz.: Genuine "Eureka" Steam Packing.

Send for Sample to

HINE & ROBERTSON,

40 Cortlandt Street, New York.

No. 8. Our List of Prizes interests all Engineers.

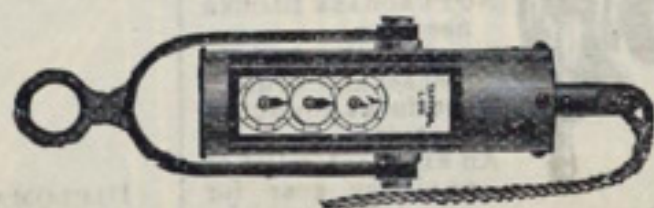
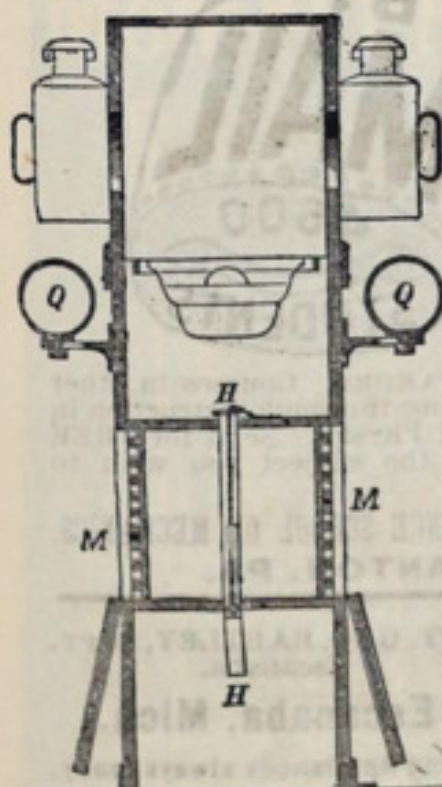
PATENT ADJUSTABLE

BINNACLE and COMPASS

FOR PILOT HOUSES.

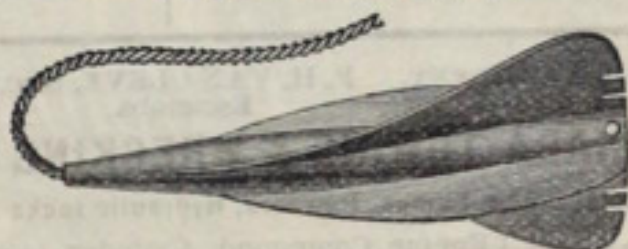
With Directions for Adjustment.
SEND FOR CIRCULAR.

..TAFFRAIL LOG..



WITH ADJUSTABLE ROTATOR.

BEST LOG IN THE MARKET.
THOUSANDS IN USE.



MANUFACTURED BY

JOHN BLISS & CO., 128 Front Street, NEW YORK.



ONE OF THESE BINDERS

that will hold 52
NUMBERS
of the

MARINE REVIEW,

Will be mailed to
any address on
receipt of \$1.

MARINE REVIEW...

516 Perry-Payne Bldg.,
CLEVELAND, O.

U. S. ENGINEER OFFICE, 366 Milwaukee
street, Milwaukee, Wis., Oct. 1, 1894
Sealed proposals for: Green Bay Harbor, Wis.,
dredging 200,000 cubic yards; Kewaunee Har-
bor, Wis., pile pier extension 325 feet; Manitow-
ood Harbor, Wis., construction of breakwater
400 feet; Sheboygan Harbor, Wis., pile pier con-
struction 900 feet; will be received here until 12
o'clock noon, Nov. 1, 1894, and then publicly
opened. All information furnished on applica-
tion. JAMES F. GREGORY, Major, Engrs.
11-1

U. S. ENGINEER OFFICE, 366 Milwaukee
street, Milwaukee, Wis., Oct. 1, 1894.
Sealed proposals for: Harbor of Refuge Mil-
waukee, Wis., extending breakwater 300 feet;
Racine Harbor, Wis., pier extension 150 feet;
Kenosha Harbor, Wis., pier extension 150 feet;
Waukegan Harbor, Ill., pile pier extension 240
feet; will be received here until 12 o'clock noon,
Nov. 6, 1894, and then publicly opened. All in-
formation furnished on application. JAMES F.
GREGORY, Major, Engrs.
11-2

FOR SALE

(CHEAP IF SOLD THIS FALL)

STEAMYACHT LUCILLE

FIVE YEARS OLD.

Length, 66 ft. Beam, 12 ft. Draft, 5 ft.

Compound Engine, 8" and 15" by 10". Dean's Air Pump and Condenser.
Smith's Patent Pipe Boiler (built 1892) 6 ft. x 5½ ft. 20 square ft. grate area.
Pressure allowed, 200 lbs. 2 Pumps. Bunker capacity, 6 tons.
Schooner rigged. Pilot House and Cabin of Cherry.
Sleeping accommodation for 9 Passengers, besides Crew.
Hull of Oak. 2 Dingies, Anchors, etc.
Fully equipped, in running order, allowed 25 Passengers.

FOR PRICE, ADDRESS

DETROIT BOAT WORKS, Detroit, Mich.

Subscribers will avoid danger of mistakes by
giving the old as well as the new address when a
change is desired.

HARVEY D. GOULDER,
LAWYER AND PROCTOR IN ADMIRALTY,
CLEVELAND, O.

W. H. COOK,
CAPT. J. A. CALBICK,
J. B. CLOUGH.

COOK, CALBICK & CO.
Vessel Agents and Underwriters.
Tel., Main, 56. RIALTO BLDG., No. 23 Sherman St., CHICAGO, ILL.

H. R. SPENCER,
ATTORNEY AT LAW and PROCTOR IN ADMIRALTY.
218 Superior St., DULUTH, MINN.

C. E. KREMER, Attorney and Counselor-at-Law and
Proctor in Admiralty.
Rooms 14, 15 and 16, Bryan Block, 164 LA SALLE ST., CHICAGO, ILL.

HARVEY L. BROWN,
Attorney at Law and Proctor in Admiralty,
Buffalo, N. Y.

JOHN MITCHELL. JOHN F. WEDOW. ALFRED MITCHELL.
MITCHELL & CO.,
Vessel and Insurance Agents,
508, 509 and 510 Perry-Payne Building, CLEVELAND, OHIO.
Office Telephone, 787. Residence, John Mitchell, 3506.

C. R. JONES & CO., VESSEL AGENTS,
FIRE AND MARINE INSURANCE.
Nos. 501, 502 and 503 Perry-Payne Bldg., CLEVELAND, O.

W. M. HAYDEN,
Lawyer and Proctor in Admiralty,
Depositions and Testimony
Taken as a Notary or under a commis-
sion. Legal business and collections
promptly attended to.
1007 Sec. for Sav. Bldg., CLEVELAND, O.
Telephone 2297.

C. A. Macdonald. J. J. Rardon.
C. A. MACDONALD & CO.
General Insurance Agents,
RIALTO BUILDING, CHICAGO, ILL.
H. S. LORD. J. H. NORTON.

LORD & NORTON,
Attorneys-at-Law,
Proctors and Advocates in
Admiralty,
DULUTH, MINN.

White, Johnson & McCaslin,
ATTORNEYS-AT-LAW,
—AND—
Proctors in Admiralty,
26-27 Blackstone Building,
CLEVELAND, - OHIO.

THOS. WILSON,
MANAGING OWNER
WILSON'S TRANSIT LINE.
Gen. Forwarder.
Freight and Vessel Agent.
CLEVELAND, O.

C. F. Palmer. Chas. Hutchinson.
P. J. Minch.
PALMER & CO.,
Vessel Owners and Agents,
(John H. Palmer and John T. Hutch-
inson, Associates.)
Perry-Payne Bldg., Cleveland, O.

W. A. HAWGOOD. C. C. CANFIELD.
HAWGOOD & CANFIELD,
Vessel Agents and Marine Insurance,
604-605 Perry-Payne Bldg.,
Cleveland, - Ohio.
Telephone No. 2395.

GEO. D. FELLOWS,
VESSEL AGENT,
Fire & Marine Insurance.
Cargoes a Specialty.
WHOLESALE OF SALT.
RACINE, WIS.

ORESTES C. PINNEY,
Lawyer and Proctor in Admiralty.
Rooms 722 and 723 Perry-Payne Bldg.
CLEVELAND, OHIO.
Telephone 2585.

ISAAC N. HUNTSBERGER,
ATTORNEY-AT-LAW,
—AND—
PROCTOR IN ADMIRALTY,
TOLEDO, OHIO.

E. T. HITCHCOCK,
Average Adjuster,
184 Main St.,
BUFFALO, N. Y.

H. J. WEBB & CO.
SHIP BROKERS, VESSEL OWNERS and AGENTS,
Established in 1856. H. J. Webb & Co.
will charter vessels for the lake trade.
Special attention given to chartering ves-
sels in the Lake Superior Iron Ore trade,
both for the season and single trip.
No. 606 & 607 Perry-Payne Building,
Cleveland, O. Office Telephone No. 338,
Residence No. 3228.

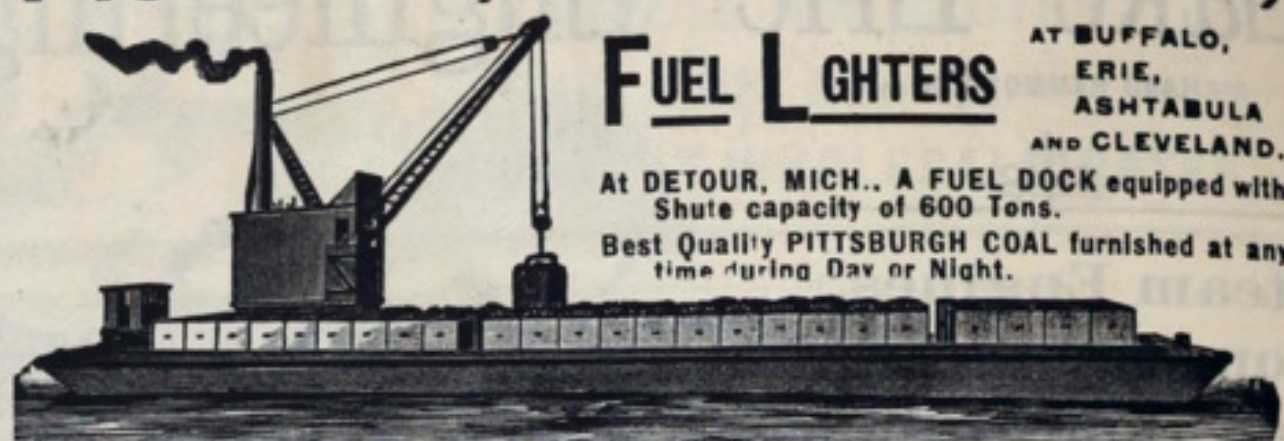
J. T. ROSE. FRANK B. LAZIER.
ROSE & LAZIER,
Vessel Agents and Brokers,
and Marine Insurance,
16 Board of Trade,
DULUTH, - MINN.

Established 1857.
THOMAS MARKS & CO.,
Merchants,
Forwarders and Shipowners,
Port Arthur, Canada.
N. B.—Special attention given to char-
tering vessels.

Capt. LYMAN HUNT. JAMES P. HUNT.
L. HUNT & SON,
Vessel Brokerage & Marine Insurance,
Room 9, Exchange Building.
Telephone No. 522.
No. 202 Main St., BUFFALO, N. Y.

Geo. H. Macdonell. J. J. O'Connor.
Macdonell & O'Connor,
VESSEL AGENTS AND BROKERS,
Fire and Marine Insurance.
Boats consigned to our care will receive
prompt despatch.
Special attention to chartering out of Port
Arthur and Fort William.
Address, PORT ARTHUR, CANADA

Pickands, Mather & Co.,



Western Reserve Building, CLEVELAND, O.

TOLEDO FUEL CO.
Cambridge, Hocking, Jackson
and Massillon Coal
Wheeled on or put on with DERRICK.
NIGHT OR DAY.
SATISFACTION GUARANTEED.
H. H. WILLIAMS, Manager.
Located on Penn. Dock, TOLEDO, O.

Mullen-Gatfield Coal Co.

— DEALERS IN THE CELEBRATED —
MANSFIELD AND YOUGHIOGHENY COALS.
Docks at SANDWICH, ONTARIO, opposite the Fort at Detroit, with chutes for rapid fueling.
Elevated docks and derrick at AMHERSTBURG, ONTARIO.

THE CUDDY-MULLEN COAL CO.
Dealers in COAL. Docks at Government Pier, Whiskey Island, and Ad-
joining Globe Dry Dock.
All fully equipped with Revolving Derricks; also, Lighter Carrying Derrick
and One Hundred Two and One-Half Ton Buckets.
Main Office, 81 Perkins Building, East Side of Main Street Bridge.
Dock Office, 127 West River St., Cleveland, O. Telephone No. 8.
Boats Coaled Day and Night. Docks at Amherstburg,

Ohio & Pennsylvania Coal Co.
FUEL DEPARTMENT.
MINERS AND SHIPPERS,
Youghiogeny and Ohio Steam Coals. Steamboats, Tugs, etc., Coaled day or
night, DOCKS FOOT WEST RIVER STREET. WHISKEY ISLAND GOVERNMENT
PIER and C. & P. R. R. SLIPS. Also STEAM LIGHTER—Equipped with
Revolving Derrick and (100) two ton buckets.
Telephone 1608. Office, 130 West River St., CLEVELAND, OHIO.

STEAM YACHTS USE
Compound Engines
To Increase Power, and
save one-third boiler
capacity.
The Coulter & McKenzie
Machine Co.,
P. O. Box 1127,
Bridgeport, Conn.

**SNELLING'S
PATENT
STEERER**
For Steamers, Ships,
Tugs, Yachts, Coal
Barges, Etc.
The drum has power-
ful internal gearing.
No PURCHASE BLOCKS
needed.
Simple as the common
"wheel and drum."
Powerful as any Screw
Steerer.
An excellent relief or
auxiliary gear for
vessels that steer by
steam.
Send for Circular.
J. H. SNELLING,
158 South Street,
NEW YORK.

MECHANICS



DIPLOMAS AWARDED. Courses in other
trades, all including thorough instruction in
Mathematics and Physics. Send for FREE
circular, stating the subject you wish to
study to
THE CORRESPONDENCE SCHOOL OF MECHANICS,
SCRANTON, PA.

H. A. BARR, PRESIDENT, F. H. VAN CLEVE, SEC. CAPT. GEO. BARTLEY, SUPT.
Escanaba. Escanaba. Escanaba.
ESCANABA TOWING & WRECKING CO., Escanaba, Mich.
Tugs, Lighters, Steam Pumps, Hawsers, Hydraulic Jacks and Diving Appliances always ready.
TUG MONARCH, Engine Compound, Cylinder 16 and 30 inches diameter, 30 inch.
Stroke, Steam Pressure Allowed, 125 pounds.
TUG DELTA, Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds.
TUG OWEN, Cylinder 20 by 20, Steam Pressure Allowed, 104 pounds.
CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction

S. F. HODGE & CO.

MARINE ENGINES,
PROPELLER WHEELS,
DECK HOISTERS,
MARINE REPAIRS.
320 ATWATER STREET,
DETROIT, MICH.

Does Your Commutator Cut or Spark?

— IF SO, —

TRY OUR SELF-LUBRICATING DYNAMO BRUSH,
WHICH ABSOLUTELY PREVENTS IT.

MANUFACTURED BY

The F. P. Little Electrical Construction and Supply Co.

No. 135 Seneca St., BUFFALO, N. Y.

SEND FOR PRICES.

Paint your Vessels with **L. S. G. Graphite Paint.**

NO BLISTERING, CRACKING OR SCALING.

Made especially for Stacks, Decks, Sides, Hulls and Water Compartments. Strictly anti-rust, and most durable and economical.

DETROIT GRAPHITE MFG. CO., 541 River St., Detroit, Mich.

THE Bethlehem Iron Company

PRINCIPAL OFFICE and WORKS:

SOUTH BETHLEHEM, PENNA.

Steel Rails, Open Hearth, Bessemer and Nickel Steel
Billets and Forgings.

Hydraulic Forged Shafting, Hollow or Solid.
Cranks, Rolls, Etc.

Rough Machined or Finished.

Fluid Compressed Steel.

GUNS and ARMOR.

New York Office,
80 Broadway.

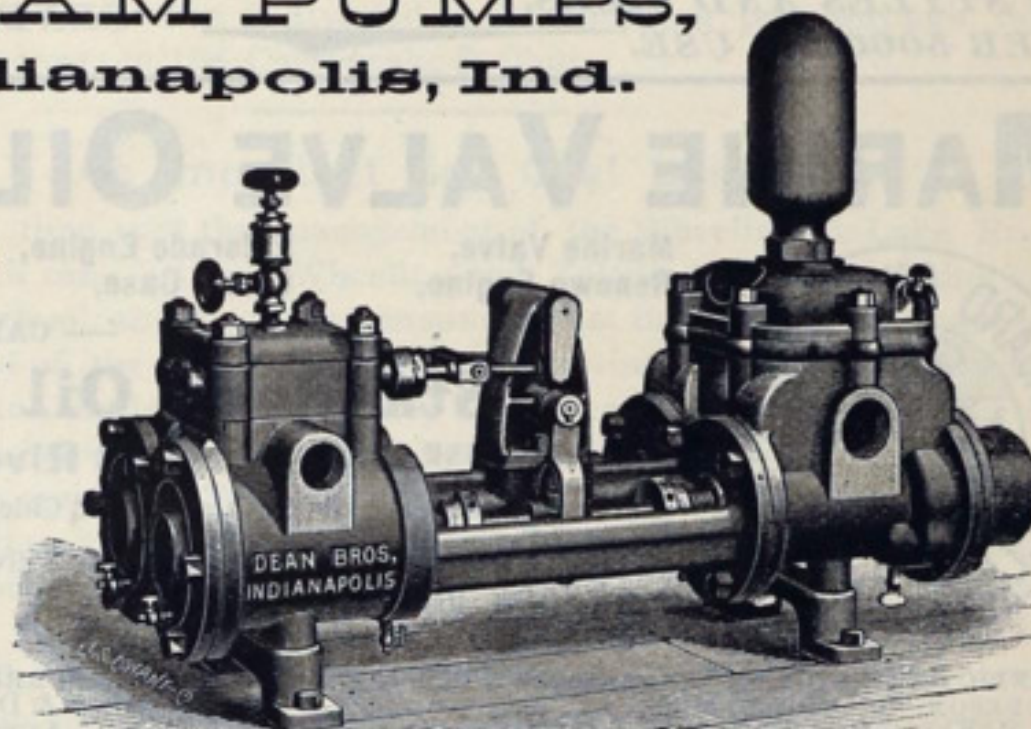
Philadelphia Office,
421 Chestnut St.

Western Agents, FISHER & PORTER,
1025 Monadnock Building, Chicago, Ills.

DEAN BROTHERS, STEAM PUMPS, Indianapolis, Ind.

Boiler
Feeders,
Air Pumps
and Con-
densers,
Ballast
Pumps,
Fire
Pumps,
Bilge
Pumps.

SEND FOR
CATALOGUE



MILWAUKEE BOILER COMPANY,

[Successor to R. Davis Marine Boiler Works.]

Manufacturers of Marine and Stationary Boilers, Smoke Stacks, Tanks, Etc.

MARINE REPAIRING | Open Day | OFFICE AND SHOPS,
SPECIALLY ATTENDED TO. & Night. OREGON BET. BARCLAY & So. WATER STS.

L. McCREOR, Supt.

MILWAUKEE, WIS.

Telephone 742.

THE CONDIT FULLER CO.

CLEVELAND, OHIO.

BAR IRON, SHEET IRON, PLATE IRON, PIG IRON,
BOILER RIVETS,
BOILER TUBES, GAS PIPE, BOAT SPIKES, PLATE STEEL,
CLINCH RINGS, STEEL NAILS.

Sales Agents of
THE CARBON STEEL CO.

Manufacturers of
OPEN HEARTH STEEL,
SHIP PLATES, BOILER PLATES,
ARCHES and STRAPS FOR VESSELS A SPECIALTY.

Write for Prices and List of Sizes.

McMYLER MANUFACTURING CO., 180 COLUMBUS STREET, CLEVELAND, O.

— SOLE MAKERS OF THE —

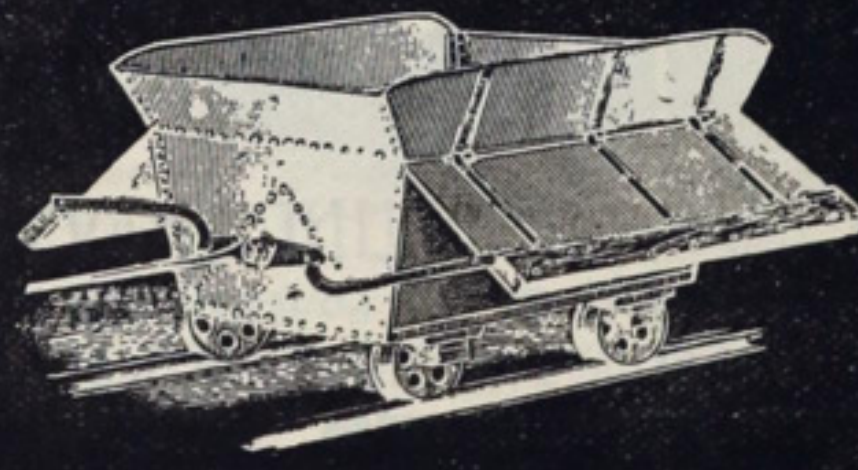
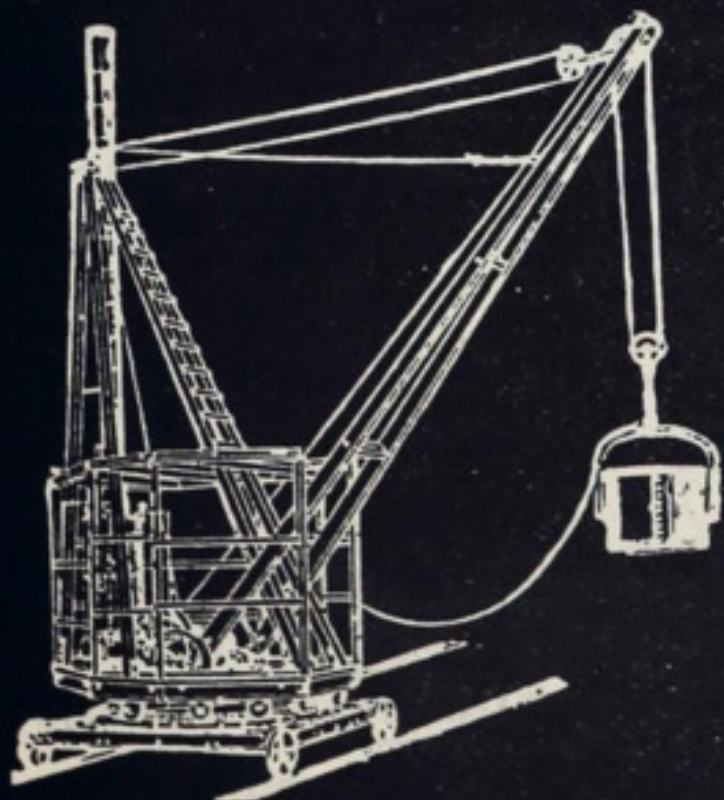
McMYLER PATENT REVOLVING STEAM DERRICK

FOR HANDLING COAL, ORE AND COARSE FREIGHT
OF ANY DESCRIPTION.

This Derrick can Lift Load, Alter the
Radius of Boom, Swing in Either
Direction at Will of Operator, and
can Propel Itself on Track any De-
sired Distance.

BUILT FOR ANY CAPACITY WANTED

BUILDERS OF
**CONVEYORS, COAL BUCKETS, ORE
BUCKETS AND DUMP CARS.**



FRONTIER IRON WORKS

MARINE ENGINES, DETROIT, MICH.

AMERICAN SHIP WINDLASS CO. P. O. BOX 53, PROVIDENCE, R. I. BUILDERS OF THE

"Providence" Windlasses and Capstans

350 STYLES AND SIZES.
OVER 5000 IN USE.

SEND FOR CATALOGUE.

FRANK S. MANTON, AGENT.

MARINE VALVE OIL For Internal Lubrication Renown Engine Oil For External Lubrication.



Marine Valve,
Renown Engine,

Eldorado Engine,
Crank Case,

Victor Signal,
Dark Lubricating,

Mineral Seal,
Head Light,

Artic Cup Greases,
and Lard Oils.

— CARRIED IN STOCK AT THE —

Standard Oil Company's Marine Depot,

TELEPHONE 77.

123 River Street, CLEVELAND, O.

MAIN OFFICE TELEPHONE 682.

ALSO FOR SALE
BY
**STANDARD OIL
COMPANY,**

No. 5 Wabash Ave., Chicago, Ill.
Racine, Wis.
Broadway & Mason, Milwaukee, Wis.
Sheboygan, Wis.
Manitowoc, Wis.
Green Bay, Wis.

Marquette, Wis.
Oshkosh, Wis.
Duluth, Minn.
West Superior, Wis.
Hancock, Mich.
Marquette, Mich.

Sault Ste. Marie, Mich.
Michigan Central Railway & 10th St.,
West Bay City, Mich.
Eighth & Sears Sts., Saginaw, Mich.
46 Jefferson, Detroit, Mich.
Summit & Monroe Sts, Toledo, O.

ATLANTIC REFINING COMPANY, French & 16th Sts., Erie, Pa.
D. ROBESON, Port Huron, Mich.
W. S. MCKINNON, Ashtabula Harbor, O.
HULL & RAND, Huron, O.

STANDARD OIL COMPANY, Star Oil Works, Buffalo, N.Y.
BABY & DALE, St. Clair, Mich.
N. C. ALTEN, Lorain, O.
A. F. HARRINGTON, Conneaut Harbor, O.

A. H. MCGONAGIL, South Chicago, Ill.
MARINE SUPPLY CO., Fairport, O.
F. KRANZ, Sandusky, O.
THE M. I. WILCOX CORDAGE & SUPPLY CO., Toledo, O.



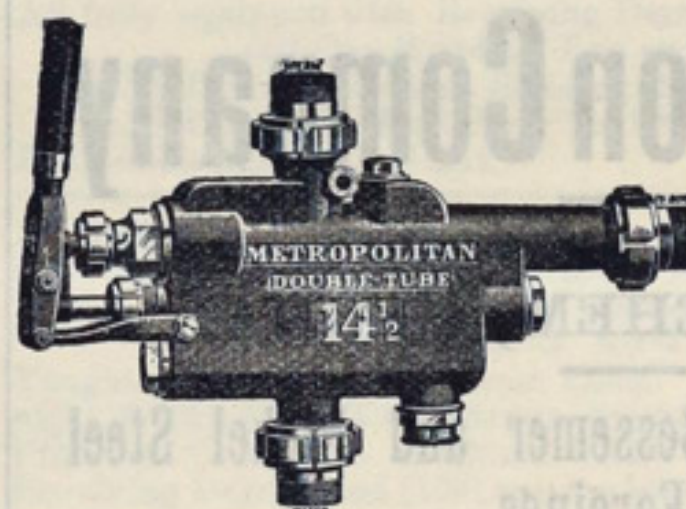
"See Quadruple Expansion Engine"

SAVES SPACE AND FUEL.

Particulars of the above and list of vessels where applied furnished on application.
Sole Manufacturer under the Patents,

HORACE SEE, No. 1 Broadway, New York.

THE METROPOLITAN DOUBLE-TUBE INJECTOR.



ADOPTED by the Largest
Shipbuilders and users,
as it is . . .

The Only Injector which
Gives Satisfaction

UNDER the SEVERE CON-
DITIONS OF MARINE
SERVICE.

SEND FOR OUR CATALOGUE 1894

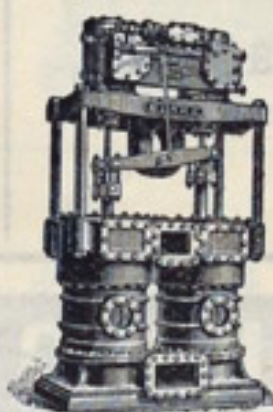
THE HAYDEN & DERBY MFG. CO.

No. 111 and 113 Liberty St., NEW YORK.

THE GEO. F. BLAKE MFG. CO.

BUILDERS OF

MARINE PUMPS

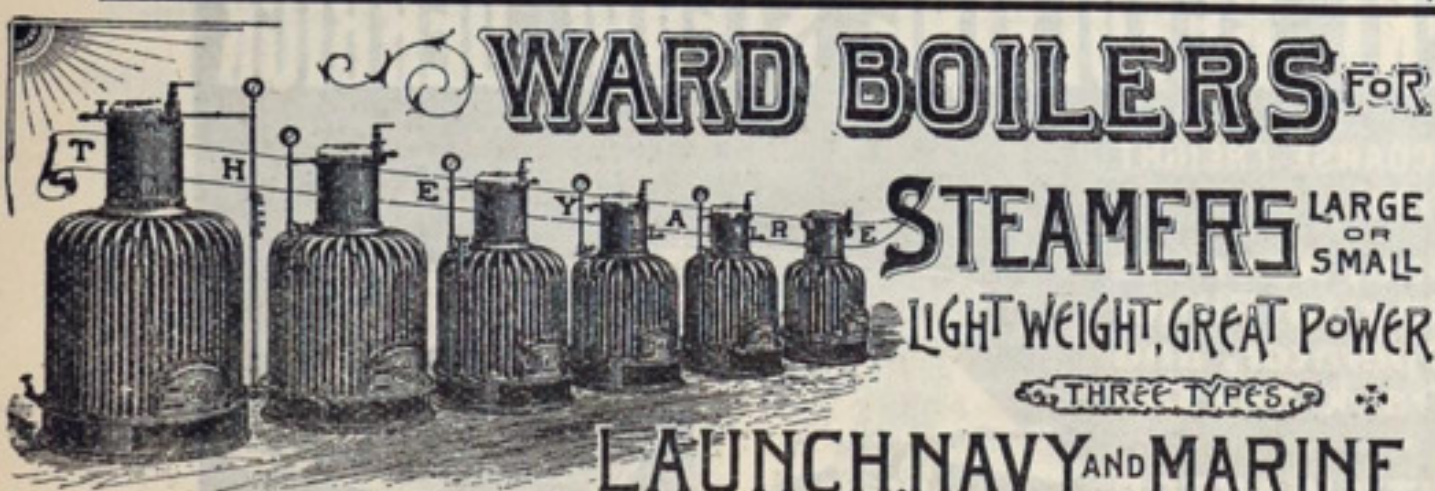


Single and Duplex Pumps for Boiler Feed,
Fire or Bilge Service—Vertical and Horizontal.

Vertical and Horizontal Pumps, Air Pumps
for Surface and Jet Condensers.

AIR PUMP ON
U.S. CRUISER NEW YORK.

95 and 97 Liberty St., NEW YORK.



ADOPTED BY U.S. GOVERNMENT. WAR VESSELS, LAUNCHES.
REVENUE CUTTERS, TUGS.
AFTER THE MOST EXHAUSTIVE COMPETITIVE TESTS.

CHARLES WARD,
CHARLESTON, KANAWHA CO., W. VA.

In Use
on 1000
Lake
Steamers.



75,000 IN USE.

...HAVE YOU READ THE VERDICT!

UNITED STATES. DEPARTMENT F.—MACHINERY.
Exhibitor—Penberthy Injector Co., Address, Detroit, Mich.
Group 77. Class 489.

Exhibit—Automatic Injectors Single Jet Type.

AWARD.—They are efficient and reliable, simple in design and construction, thoroughly automatic under varying conditions, showing great lifting power through hot or cold suction pipe, and are easily operated and capable of working under a broad range of possibilities.

(Signed) O. EMERSON SMITH, Individual Judge.

Approved: JOHN A. ROCHE,

President Departmental Committee.

Approved: JOHN BOYD THACHER,

Chairman Executive Committee on Awards.

Date, June 8, 1894.

Buy a Penberthy and be Happy.

Penberthy Injector Co.

DETROIT, MICH.